COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

[illegible]

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NBS Says DP Center Noise May Cause Loss of Hearing

By Peter F. Carr

CW Staff Writer

WASHINGTON – The noise levels in computer centers are frequently of sufficient magnitude to cause permanent hearing damage, in addition to "relatively simple errors by programmers," according to the results of a recent investigation by the National Bureau of Standards (NBS).

The investigation found that in most typical computer installations, it was difficult, if not impossible, to carry on a conversation at distances greater than six feet. This is an indication of hazardous, rather than merely annoying, conditions, the report stated, and is detrimental to both communication and concentration, as well as hearing.

A noise level of about 80 dB exists in many computer centers when the computer is in its quiescent condition, that is, when there is no reading, printing, or punching.

With the equipment working, sound meter measurements in a typical computer center showed long-term noise levels ranging from 89 dB to 94 dB, depending on the particular operation taking place.

These noise levels mean that persons working in the area are risking loss of hearing, the report stated. Significant risk of damage to hearing exists if a half-day's exposure to levels in excess of 90 dB occurs with any regularity.

Exposure for a full working day should not be in excess of 85 dB, according to the Bureau.

Noise-Induced Loss

In addition, it has been proposed on the basis of medical studies of noise-induced hearing loss that the criterion level be lowered by another five dB, if the sounds are sharp and pierc-

(Continued on Page 4)

Dorothy Weidner of the National Bureau of Standards experiences some difficulty in a phone conversation in the computer center.

Sparse crowds almost seemed to disappear in the large exhibit area of the DPMA Convention in Seattle.

Reality Takes Glow From DPMA's Show

By Phyllis Huggins

CW West Coast Bureau

SEATTLE – Attendance was down at the DPMA International Data Processing Conference and Business Exposition reflecting the slow economy, tightened corporate travel budgets, and the remoteness of Seattle's location to main population centers.

Absent from Seattle was the glamor that surrounded last year's conference in Montreal.

2,500 Attendees

About 2,500 attendees were registered as opposed to earlier predictions of 3,200. The number of visitors to the exhibit area fell far short of the estimated 20,000.

Seminars were solidly attended and well received, however.

Traffic in the exhibit section was light, partly because larger booths were spread over much space.

The number of exhibitors had dropped to 90 from last year's 113.

Another indication of the slower economy appeared as recruiting literature and "head-hunting" activities were almost nonexistent.

Computerized Values

DPMA officals, in an attempt to stimulate the thinking of the attendees with subject matter not available in the seminars, picked Dr. Robert Morris as keynoter.

Morris – an educator, philosopher, and president of the University of Plano in Texas, which e founded – blamed the country's unrest on the void of spirituality and morality, as well as pressure by foreign governments on the country's youth.

Morris also said that morality could be given computerized, qualitative and quantitative values.

Man of the Year

The Computer Science Man of the Year award went to Dr. Frederick P. Brooks Jr., chairman of the department of computer information and science, University of North Carolina. It was presented in absentia.

Cmdr. Grace Hopper, recipient of last year's award, was given the additional honor of being the first outsider to be made a lifetime member of the association. Cmdr. Hopper commented privately that the DPMA people are avid to learn, more so than the ACM members. As she put it, "They have the biggest job – that of educating management."

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Bell Non-Carrier Interconnection Service Hit by Panel; Data Exchange Called Poor

By Ronald A. Frank

CW Technical News Editor

WASHINGTON, D.C. – A National Academy of Sciences (NAS) study panel has told the Federal Communications Commission that the telephone companies have been slow in providing the devices required to interconnect non-carrier equipment with the phone network. In addition, the report cited a lack of information exchange among carriers, users, and others involved with implementing the new interconnection tariffs.

The findings were detailed in a NAS report commissioned by the FCC last year to investigate the technical aspects involved with interconnecting computer data and other non-carrier devices with the phone system.

Carterfone Decision

The interconnection of equipment not manufactured by common carriers (such as AT&T) was first sanctioned in 1968 in FCC tariffs that were an outgrowth of the Carterfone Decision.

Released last week, the Report of a Technical Analysis of Common Carrier/User Interconnections said "the ability of the carrier[s] to respond rapidly enough to new situations where new interconnection arrangements are required" was questioned by some suppliers of equipment and services.

The report said these parties had expressed the opinion that "the presence of the carrier-owned interconnecting arrangement [device] will impede innovation on the user's side of the interface where the goal is to optimize the user's system or use of equipment."

The interconnecting devices discussed in the report include the Data Access Arrangement (DAA) device required by Bell

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and Terminals Supplement
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CW Opens Bureau in Washington

WASHINGTON, D.C. – *Computerworld* has opened a news bureau at Suite 510, 2021 L St. N.W., Washington, D.C.

Alan Drattell, former editor of *Information Week* and executive editor of *Business Automation*, will be *Computerworld*'s Washington news bureau chief.

In addition to his solid experience in computer trade publications, Drattell has strong newspaper background as a reporter on the *Daily Journal-Gazette*, in Matton, Ill. and as managing editor of the *St. Albans Life* in Long Island, N.Y.

The offices will also house *Computerworld*'s Philadelphia-Washington sales offices under John Cummings, district sales manager.

The Washington bureau will enable *Computerworld* to provide more complete coverage in the Washington-Philadelphia areas. *Computerworld* now has a network of four bureaus: New York, Chicago, Los Angeles, and Washington.

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Attendance Down at DPMA Show in Seattle

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The president of DPMA is James D Parker Jr., assistant manager, systems and data processing Texas Eastern Transmission Corp Shreveport La Edwin O. Linevack, commercial airplane programs computer services manager, Boeing Corp., is the newly elected executive vice-president

Exhibits

Univac was conspicuous among the exhibitors with the largest exhibit it has shown in some time The 9400 real-time system complete with disk and tape made its first appearance at any trade show

IBM showed its System/3 and some terminals but the major space was devoted to contract services

Honeywell Data Products Division exhibited for the first time its Keyplex card-to-disk system According to a Honeywell spokesman, Keyplex was being shown at the DPMA because the joint computer conferences have a "mixed bag" of attendees while the attendees of the DPMA conference are thinking of replacing large numbers of keypunch operators the essence of their data processing operation

The exhibits reflected the particular nature of the DPMA with an absence of high technology and sophisticated terminals

Directors Meeting

At the DPMA annual board of directors meeting discussion centered on money as the organization projected a marginal $4 740 surplus for its 1970-71 budget with expenses of $4,768,685 The following year's forecast projects a loss of $87,825 with income of $1 958,225

Efforts will be made by the DPMA to cut costs and balance the budget One item questioned was the $75 000 per year to operate its own computer center The DPMA officials pointed out in private that the association is feeling the national profits pinch situation but is solid financially due to sizable reserves

Patients Consult Computer

GLASGOW Seventy patients at the Southern General Hospital are taking part in 20-minute experimental consultations with the computer, called Docto.

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NS May Give User First Real 'Unbundled' Savings

By Peter L. Briggs
CW Technical Research Editor

The upcoming NS computers may be IBM's first real opportunity to unbundle a computer system. Though the new machines will most likely be transitional and part of the 360 family in name (360/125, 135, 145, etc.), they will actually have been separately developed, and, as such, the software can be charged for directly.

With the current 360 line, the entire cost of the software was already expended before IBM announced unbundling. The reduction in price due to separate pricing of software and services, therefore, could only amount to about 3%. With NS, the unbundled pricing savings to the user could amount to 18% to 30%.

Languages

IBM has provided only a few insights into the probable pricing policy for compilers, with the announcements of the Time-Sharing Option for OS and the Interactive Terminal Facility for DOS.

Based on these examples, compilers will probably run from about $200 to $400 for full-scale compilers like Fortran H equivalents. With structured pricing, IBM could place strong emphasis on any desired language – for example, PL/1.

By providing a variable micrologic capability, where the user can alter the basic instruction set of the machine or where IBM can provide complete packages that imitate an older machine like a 1401, IBM has introduced firmware into its product line.

Such firmware will certainly carry a separate price tag, one designed to make the NS more attractive to particular classes of users with particular emulation problems. It will probably take IBM some time to produce a complete set of IBM-compatible firmware.

Outside software vendors, as well as other manufacturers, will then be able to enter the competition, by offering alternative firmware for different, or non-IBM machines. These packages will, no doubt, be priced competitively with those available from IBM.

System utilities like the Sort/Merge and the data utilities will be priced separately. Most of these utilities are not significant, and could be carried over from the free versions available under bundled OS.

New Sorts, however, represent a sizable saving for most users. Many users still spend 40% to 60% of their time sorting records, in spite of the general advantages of direct-access files.

IBM, with its awareness of the needs of the true, next generation, might find it desirable to force users into random files, and away from sequential files. This pressure could be applied through higher pricing of such packages as Sorts.

The user does not have to buy these separately priced packages, if he can imitate his 360 on the new NS. But he will buy these packages becuase IBM has much superior versions of much of its software either ready or soon to be ready for delivery to him.

A PL/1 compiler, perhaps Version IV, that offered two to three times improved efficiency and required less memory for compilation and execution, would both encourage the use of PL/1 and make users more willing to pay the price for good software.

An Isam that would retrieve variable-length records and would simplify the indexing procedure might give the user a 25% improvement in overall system performance, at a price. The price would not be too high for a user who depended heavily on Isam for his primary file processing.

An imitator for the 7094 that would make an NS system run several times faster than the 360/65 or 360/50 emulating the 7094 would be well worth the price. The number of additional hours of available system time would more than repay the cost of the imitator. In fact, if the NS/2 were to be offered for about half the price of a 360/65, and were to perform about as well in 360 mode, it would also perform as well imitating the 7094, something the 360/65 cannot do.

Separate pricing, though the apparent cost is much higher than a bundled cost, would really pay off for users with NS. The basic hardware prices are lower than for comparable current 360s. Variable micrologic software can be very valuable for the user in imitative mode, or in trying to take maximum advantage of either a communications or large file access system. The extendability of the transitional new family (NS) would greatly ease the conversion into the true fourth generation, probably due for announcement during late 1974 or early 1975 – the distributed computing system.

In Part I (May 20) of CW's continuing series on IBM's new computers CW speculated on the principle features of the new series including cost/performance ratios.

Part II (May 27) covered the variable micrologic design and the problems and benefits related to micrologic programming.

Part III (June 10) pinpointed a major problem brought about by the necessity to rewrite communications programs in order to achieve the most effective use of integral communications ability.

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Panel Calls Interconnection Service Slow

(Continued from Page 1)

System companies to be installed between user's non-Bell equipment and the telephone network.

The report said that "users have found that [these types of devices] which are nominally available are not actually readily available in all Bell System companies when [users] want them and [are] not available at all in some independent companies."

The paper conceded that this situation is inevitable in the initial stages of a change "as significant as interconnection." It added, however, that "many people feel the carriers will not be able to respond rapidly enough with new protective arrangements."

The report said that the inclusion of the protective devices directly within terminal equipment might be a way to overcome this problem.

The report stated that Bell System representatives had agreed to the concept of including integrated protective devices into customer non-Bell equipment, but variations in the design of data terminals could present problems.

Data Dissemination

On the subject of disseminating information about interconnection, the report said data-related organizations should be encouraged to assist in improving the flow of technical data among the carriers, manufacturers, and users.

The NAS panel said mechanisms should be established to "promote a two-way exchange concerning problems of interconnection interfaces among users and suppliers and between them and the carriers. This exchange is vital to the problem of possible liberalization of interconnection and the resulting integrity of the public telephone network."

The report said that uncontrolled interconnection to the common carrier network could cause harm unless some plan of protection were implemented. The assurance of protection could be implemented by persons "with normal technical competence," it said.

The telephone companies and Bell, in particular, have repeatedly claimed that interconnection was a complex technical matter that could cause harm to the phone system unless protective measures were implemented only by the carriers.

In concluding that protection should be based on mutually agreed upon standards, the panel said a program of properly enforced certification of equipment, installation, and maintenance might be one method of protecting the network from possible harmful effects.

The NAS report to the FCC is strictly advisory in nature. An FCC spokesman told CW that the commission will probably solicit comments from interested parties concerning the report. In addition, the commission has retained an independent communications consultant, Dittberner Associates, to analyze the NAS findings.

The FCC spokesman said that this analysis should be delivered to the commission in about a month. Conceivably the commission could ask for comments within the next few weeks so that both the comments and consultant's analysis could be considered concurrently.

Study Says Noise Levels in DP Labs Can Cause Loss of Hearing, Errors

(Continued from Page 1)

ing, as the printer's and punch's are.

E.L. Corliss and R.D. Berendt of the NBS found in their experiments that substantial coatings of acoustic tile on the ceiling and upper parts of the walls did little toward solving the problem.

Other techniques, however, can be applied to reduce the noise level.

Personnel working in the area should have their hearing tested at frequent intervals, and should protect their ears until conditions permit conversing at a reasonable distance without shouting. Additionally, personnel should not remain in the area if their presence is not required.

The report suggests that the following recommendations should be followed in order to reduce noise levels:

- All openings around card punches, readers, and printers should be covered with clear, lucite shields with soft, rubber gaskets to effect an airtight seal.
- All drive motors and cooling fans should be vibration-mounted on rubber pads.
- All console panels should be treated with viscoelastic-type vibration damping material.
- Fiberglass board liners should be installed on the inside surfaces of console panelling to reduce the noise buildup in the hollow, reverberant cavities.
- Resilient pads or vibration isolators should be installed under all equipment to reduce low frequency, vibratory transmission to the supporting false floor.

Acoustically lined partial enclosures (U-shaped) should be installed around individual computers.

If these measures cannot be adopted, the report said, all computers and associated equipment should be located in a separate room, away from office personnel.

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New England Computer Users Gambling On Reassurances of Power Company

By Edward J. Bride
CW Staff Writer

BOSTON – Power experts and consumers alike are predicting electrical brownouts, maybe even blackouts, for metropolitan areas throughout the country this summer.

New England is an exception, and in Boston, the country's sixth largest metropolis, computer users are gambling on the assurances of the power company for a successful season.

Very few have bothered to check on emergency power supplies, or on the effect of a sudden drop or outage of electricity.

One major user went so far as to say that he did not expect a power brownout – "we're gambling on it, I know" – simply because Boston Edison had said that conditions should be safe for this summer.

What the power company actually said was that there should be "available electric energy to meet our customers' needs under any but the most drastic conditions."

The "most drastic conditions," according to various company officials, depends on the weather. Conceivably a "protracted" heat wave of over a week could bring disruption to the DP centers through consecutive voltage drops.

Boston Edison Vice-President James M. Lydon also noted that "it will be necessary to have some major units (generators) out of service for overhaul during the period of peak load exposure," expected in late August.

Jumbled Data

Most users who know that a sudden drop in power can mean broken tapes or jumbled data still have not bothered to take corrective measures.

One user is "thinking" about an emergency battery, "on-line" with the power company's supply so it can immediately take up the power load. The user is "not so sure" it would be economical, since such emergency systems can start as "low" as $36,000.

Such a battery system is manufactured by Power Systems and Controls, Inc. (PSC), Richmond, Va. Its on-line battery would give a user from five to 15 minutes to shut down his computer without data loss.

Beyond 15 minutes, said PSC Vice-President Ralph Amos, a user would need an emergency generator to restart and maintain his air conditioning.

The bulk of PSC's emergency computer power supply sales are to users in Manhattan, which needed emergency current from New England and other power companies as far away as Richmond last year, Amos said. In fact, even Richmond was placed into "brownout conditions" because of emergency power supplied to New York.

New York is slated, moreover, for its share of brownouts this summer [CW, June 24].

The 1965 blackout created many computer veterans, but few had third generation equipment. Many were 1401 users, who were shutting down their equipment for the day.

One such area user now has a 360/40, the "minimum configuration" which could justify an expensive emergency power supply, according to one source.

This user said he was "very, very lucky" in 1965, but still has made no special studies and has taken no special precautions for 1970.

A state government user indicated that most of the state's long programa have "intermediate checkpoints," so that, if there were a disk crash or a broken tape, "we'd only lose to the last checkpoint," perhaps 10 or 15 minutes.

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Editorials

Toward Better Software

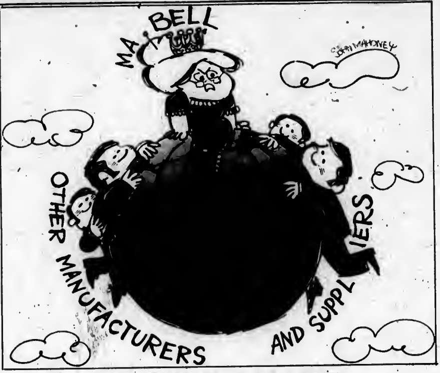
At the same time users at the IEEE Computer Conference were decrying the lack of good software word came that a software patent would be issued, the first to be processed without a court fight.

Hopefully the latter event heralds a solution to the software problem.

Programmers now will have an incentive to solve processing problems in unique ways instead of relying on standard routines. Just being classified as "inventors" should give them a lift, but the prospect of gaining fame and fortune for doing their job more efficiently should really inspire them.

After all, who wouldn't rather be described as "Jim Jones, holder of 11 software patents" than "Jim Jones, a programmer"?

Important marketing considerations aside, what we are really dealing with is public recognition of programmers' achievements.



Carterfone Decision or Not, It's Still My Network

Letters to the Editor

Government Regulation Of DP Industry Criticized

It was with grim expectations that I read CW's May 13 article on Afips professional EDP Certification. But it remained for you to make my fears concrete, when, on June 3, you advocated governmental regulation of the programming profession, in reply to David Flynn's letter. Such calls for a regulatory agency definitely do signal the disintegration of the profession. Cause of death: atrophy of the intellect.

CW's position in favor of governmental regulation should be condemned by its readership.

Intellectual responsibility demands that before advocating such a thing, you examine the consequences of governmental regulation in other industries and professions to see if the results have been beneficial to the patrons. If you examine the ICC, FTC, FDA, FAA, FCC, AMA, state public utility commissions, etc., you will find the following principles evident:

- That the loudest calls for regulation come, not from the "users," but from within the group to be regulated – some of whose members wish to "protect the public."
- That any regulatory agency takes on the complexion of the industry/profession being regulated; it becomes the defender of the prerogatives of the regulated group against demands of users.
- That the minimum standards of professional competence established by the agency become the maximum available on the market – no one bothers to exceed the minimum, as there is no competitive incentive to do so.
- That the restriction on entry into the profession causes a shortage of professionals – who then command very high salaries. (This often explains the first point. An example is the medical profession.)

Note that what is at issue here is *not* the value of professional certification, but the vesting of an agency's evaluations with *the force of law*. A "private sector" certification agency relies on its reputation for certifying a man's ability accurately. The power behind such a certification is the possibility of business ostracism against those who violate the standards of certification, or are unable to demonstrate competence according to the standards.

When a government body takes over the process of professional certification, a new and crucial element is introduced: *those who fail to meet the government-defined standards can be forcibly prevented from practicing their profession, and jailed for the "crime" of trading their services with someone voluntarily.* This is not the case with private agencies, who cannot prohibit someone from hiring an uncertified man.

This ability to prevent the uncertified from practicing is what kills innovation and destroys the regulated profession; the innovator is frequently the man weeded out by certification programs, because his mind does not run in the established patterns. A man who invents a technique which makes obsolete the skills tested by certification programs will not need to possess those skills – and may fail certification exams.

At the same time, mediocrity flourishes when an agency of the state certifies professionals. Since the shortage guarantees the certified professional that he can find work, nothing prevents him from sliding into obsolescence and slovenliness.

As long as he can maintain his skill at exam-taking, he will not lose his professional license. What regulatory agency of the state is going to call into question the validity of its own certification program by revoking the licenses of many professionals? How many physicians has the AMA caused to be drummed out of the medical profession? (How many chiropractors were drummed out of *their* profession when the State of California, at the behest of the medical associations, withdrew recognition of chiropractic?) How many dentists? Civil engineers?

No, governmental programs of professional certification cannot be regarded as a boon to any profession, or to the public which buys its services. It is a boon only to those who wish to exercise power over others. It is a definite threat to those like me who have just begun a career in computer science – and will have to endure the strangulation of the industry 10 years from now which will result from the misguided policies of today's leaders.

Computerworld should reject governmental regulation of the EDP industry and fight for private certification programs; this should be coupled with an editorial policy of thorough and front-page news coverage of certification issues and disputes. The rapid dissemination of information throughout the industry is the most powerful weapon that free-market certification can have.

Arthur A. Atkinson

Emeryville, Calif.

Most Cobol Users Have Lower Total EDP Expense

Alan Taylor's column in the June 3 issue on Cobol overhead could be extremely misleading to the average Cobol user.

- He ignores the fact that most Assembly Language programmers have received far more training in relation to performance and efficiency considerations than most Cobol programmers.
- All of the examples he gives in the article are instances of poor compiler design rather than language limitations.
- He ignores the relative cost of program development, documentation, rerun due to coding errors, and program modification between Assembly Language and Cobol.
- No mention is made of the relative expense to train and employ competent programmers in Cobol and Assembly Language.

I am confident that most Cobol users are experiencing lower total EDP expense with Cobol than they would with Assembly Language (and isn't that the name of the game?). Rather than provoking another round of the great High Level Language Controversy, Mr. Taylor could provide the average user a real service in:

- Pressing the manufacturers for more sophisticated compilers producing better object code.
- Suggesting guidelines for adequate performance training of Cobol programmers.

John Navas II
Manager Systems/Programming

Cambridge Computer
San Mateo, Calif.

Entire H-200 Series Will Handle Fortran

The June 3 issue of *Computerworld* says that the H-110 and GE 115 will not handle Fortran. I have therefore instructed all programmers and engineers to destroy their Fortran source decks. I have also sued the local GE and Honeywell salesmen for misrepresentation.

How about actually visiting a customer, some time, instead of doing your software research out of some industry digest? Of course the entire H-200 series will handle Fortran. Five minutes on the phone would have determined that.

John Culleton
Manager, Systems/Data Processing

Penberthy-Houdaille
Prophetstown, Ill.

You're right, a fact we ascertained after five minutes on the phone. However, we do call and visit users by the hundreds, and one manufacturer has jokingly complained that we ask his people more questions than all the other computer publications combined. Ed.

Wastage Is a Crime, But We Can Capitalize Elsewhere

If there is one thing that can make progressive management see red, it is resources going to waste. Sometimes, of course, it is unavoidable – snowplows are not needed in July – and they can understand this, and make the necessary allowances. But in the computer area where the equipment is both expensive and able to tackle almost any kind of job, there appears very little excuse.

Recently we have heard quite a bit about the amount of wastage that is going on in computers. Figures like 30% to 40% CP utilization have been thrown about, and have caused some managements to go into scandal-provoked action to bring the wastage down. The results of such action can, indeed, be measured by the amount that it does reduce the wastage, and can impress management with that one figure alone.

Choice Available

But, to a professional, wastage is only one of the two ways that can be used to improve throughput. And, while wastage figures are certainly a guide to what is happening, measuring throughput rather than wastage is the better answer as to whether some particular answer has been profitable.

Naturally, sometimes he may concentrate on reducing wastage in a system. But sometimes he will find better payoffs elsewhere. He knows for instance that if there is only 1% wastage, it is not worth bothering about. But when there is more than that – where should he look?

Where would you look? Suppose there was 20% wastage, for instance – would you tend to ignore it at first, thinking that there might be other pastures that were greener? Or if it was 30% – or 40%? Where do you think that the theoretical break-even point might be? Take a minute, and write down your answer on a scrap of paper, and then compare it with my ideas at the end of the article.

To find the break-even point let us take a look again as to what the rules of the game are. Figure 1 shows the two major areas that are available for attention, the Wastage Area and the First Cascade of the Dominant Unit. Looking at these we see that to make an equally profitable savings by attacking one of the areas is going to require normally a greater percentage improvement in that area (wastage or dominant) which is smaller.

For instance, in Figure 1 where the wastage is only 10% and the Dominant Unit is working 90% of the time, to increase 1% of the overall time by attacking the wastage means that we have to reduce the wastage by 10%. By contrast we only have to reduce the Dominant Unit by 1.1% to obtain an equivalent saving.

From the computer user's point of view it does not matter where the savings come from – all he is interested in is that the saving is made. However, from the optimizer's point of view it is the percentage improvement needed that counts.

A simple optimizer's break-even chart can therefore be made as in Figure 2. This shows just how valuable a 1% saving in any area would be, depending on the percentage utilization involved. It shows that if the area concerned is already working 100%, then a 1% saving is worth 1 minute, equally, if it is not working 100%, 1% is worth something between .01 and .99 minutes; if it is working 0%, then making a 1% saving in it is not of any value.

The Taylor Report

By Alan Taylor

It further shows that the amount of profit that can be made then by reducing the Wastage Area or the Dominant Unit area by X% is simply the percentage of the area concerned multiplied by the percentage of savings achievable.

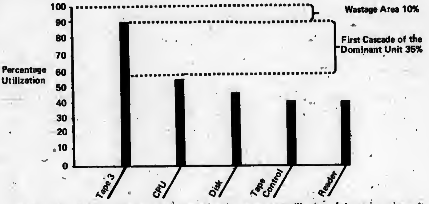


Figure 1 – Profile of a computer program showing the percentage utilization of the various elements. Note that the major areas where optimization can be performed are the wastage and the First Cascade of the Dominant Unit.

One of the items that we noticed in comparing the two types of attack was that reducing the Dominant Unit allows savings in the First Cascade to be made simply within one single area. For instance, where a tape drive is the Dominant Unit, then by speeding up the operation of that tape drive (either by changing the hardware, or by reblocking so that it is effectively speeded up, or by changing the characteristics of the data record so that it becomes more concentrated) immediate savings can be made provided that the amount of the savings is not greater than the size of the First Cascade. This was called the "singulatory factor" of the First Cascade approach.

Wastage Involves 2 Units

By contrast in the Wastage Area, wastage is occurring because two units are interfering with each other. To find out and to handle this means that not one but at least two units are to be considered.

As a result, it can be said that it is more difficult to locate and solve wastage difficulties than it is to handle the First Cascade problems. The factor by which it is more difficult is a variable and there are no strong rules at this point for any particular situation. Personally, I am inclined to use a factor of 2 to 1.

The whole idea of optimization, of course, is to get maximum results from minimum work. Constructive laziness may be another name for it. As such, the additional problems involved in handling a wastage case is that for every unit of work done you may only get half the results you could have obtained for the same amount of work used elsewhere.

Applying this 2 to 1 ratio and the previous break-even chart we find that to obtain a particular amount of savings from *optimizing the Wastage Area requires twice the amount of work needed to obtain it from the First Cascade work.*

Alan Taylor, consultant, writer, and former editor of *Computerworld*, is president of Computer Management Aids Corp. of Framingham, Mass.

From this, and working backwards a bit, it can be seen that there will be, once the wastage to the First Cascade ratio is selected, a break-even point on the chart which shows when it is more advisable to attack the First Cascade than it is to attack the wastage to obtain savings.

These things have a babit of working out simply, and as Figure 3 shows, the key break-even point, on the 2 to 1 ratio, is 67% wastage. Not 10%... or 20%... or even 40%! Did you guess right?

Now this gives us a guide. To decide whether or not to attack first the Wastage Area of the First Cascade or whether the Dominant Unit is more than 33%. If if is, attack the Dominant Unit of the First Cascade area first, then, and only afterwards, if you still want to make still further savings, consider attacking the Wastage Area. That is the way to get most savings for your optimization dollar.

This then shows how to decide between the First Cascade and the wastage method. In general, wastage now-a-days is nowhere near 67% – despite all those claims you may have read about low CP 30% utilization times. The CP utilization time is no statement of wastage. Almost always attacking the First Cascade is then a more profitable operation, even though the Wastage Area appears to be the action-provoking scandal.

Soon we will look at how to optimize various Dominant Units, including disks!

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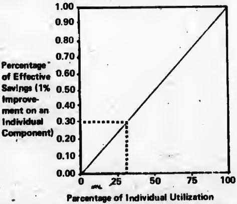

Figure 2 – Simple chart showing the effective savings produced when a 1% improvement is made on individual components of the various improvement possibilities. Note that if the component's utilization itself is only 30%, then the 1% improvement only yields a 0.3% effective saving.

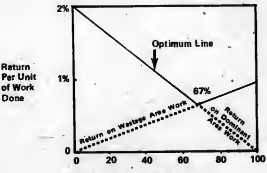

Figure 3 – Break-even chart showing the comparative return of investment that can be expected when work is done optimizing either the Wastage Area, or the performance of the Dominant Unit at various sizes of wastage. Note that under the 2 to 1 ratio (see text) the break-even point is 67% wastage, indicating that until wastage is at a quite unusual level it is better to concentrate on the Dominant Unit rather than on the Wastage Area.

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IBM Researchers Take Day Off to Protest Viet War

By Joseph Hanlon
CW Staff Writer

YORKTOWN, N.Y. – Antiwar activity has reached the computer establishment: 100 IBM researchers took a day off from work to go to Washington and campaign against the war in Southeast Asia.

The group was part of 200 industrial scientists who went to Washington last month to lobby for the Amendment to End the War. Members of the group met with 20 senators, 40 representatives, Deputy Secretary of Defense David Packard, and Presidential Science Advisor Lee DuBridge.

The importance of the trip, according to Dr. Richard J. Orgass, one of the IBM group's organizers, was that "we were not students, but a group of responsible adults who had come to say these things."

The large number of people going to Washington, Orgass continued, "demonstrates that large numbers of people are concerned about the war." These lobbying efforts are strengthening those congressmen already opposed to the war, Orgass declared, and causing many "hawks" to re-evaluate their position.

Back Antiwar Candidates

But the most significant effect of the lobbying effort may be on the IBM protestors themselves. "A lot of the people who went to Washington are now getting involved in local elections in an effort to elect antiwar congressional candidates," Orgass said. Most of these people had not previously been involved in politics.

The 100 are all from IBM's Thomas J. Watson Research Center, but Orgass stressed that they were acting as individuals. They all took the day as a "vacation day," which they are permitted to do without formal permission.

Wetson Speech

The trip was unrelated to the strong condemnation of the war two days earlier by Thomas J. Watson Jr. [CW, June 24], according to Orgass.

The primary purpose of the trip was to lobby for the Amendment to End the War, which was introduced on national televison May 12 by Senators Mark Hatfield (R-Ore.), George McGovern (D-S.D.), Charles Goodell (R-N.Y.), Harold Hughes (D-Iowa), and Frank Church (D-Idaho).

Under the amendment, all U.S. troops would be withdrawn from Southeast Asia by June, 1971, and other military support would be cut off as of that date.

California Board to Advise on Votomatic

LOS ANGELES – Latest development in the California Votomatic vote snafu is the formation of a Los Angeles County citizens election committee. The purpose of the committee is to make recommendations for action to relieve the danger of still more occurrences of vote irregularity and to apply pressure to the State Assembly to pass corrective legislation or even to eliminate the Votomatic, from further state elections.

The committee's primary concern is the protection of the integrity of the vote count and the rights of the voter to have his vote counted. The committee fears that official groups are not giving full hearing to the problems.

Three groups of citizens have presented testimony to the committee so far.

They include: the certification boards of the major political parties who had the responsibility of observers at the recent election and cited instances of lack of security, damaged votes and obscured vote count; several candidates who failed to receive accurate, or in one case any votes, due to problems with the ballot guide books; and citizens who cited cases of disenfranchisement or loss of votes due to poll irregularities.

The committee was formed because, although there are both state and county committee investigations, there is also lack of confidence that these groups are getting to the roots of the multifaceted problem.

The committee consists of 21 bipartisan citizens including five city councilmen of Los Angeles and other county cities; two mayors of cities served by the county system; one labor representative; six representatives of business; one political professional; a TV commentator; an editor of a city newspaper; CW's West Coast bureau chief, Phyllis Huggins; and a politically involved actor, Gene Barry.

Computerized Assessments

PHILADELPHIA, Pa. – The Montgomery County Board of Commssioners has approved a pilot program to determine if real estate assessments throughout the country can be equalized by computers.

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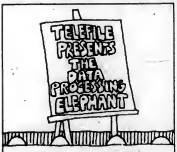

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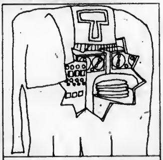

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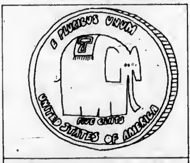

You don't have to be that big a company to afford the DPE. Because it's not that big an elephant. However, when bigger elephants are built, Telefile will build them.

Data Package Shows GE-Honeywell Compatibility

By Don Leavitt
CW Staff Writer

SAN FRANCISCO – A Honeywell software package that has been used at several installations gives an insight into how GE and Honeywell equipment can be used together, whether or not the proposed inter-company merger takes place.

A communications program written for the Honeywell 120 system allows that machine to be linked through a GE Datanet 30 controller to a GE 635 central processor. Honeywell said that the package "makes the 120 act like a GE 115 to the 635."

The 120 program was written locally by Honeywell, using Easycoder. Requiring about 4K of storage, it effectively duplicates the logic of the data communications package, Gerts, designed for the GE 115.

In this way, the 120 reacts as if it were a GE 115 working with the GE 635 central processor. Unlike the GE 115, however, it does not require a GE Datanet-10 controller.

Instead, the 120 uses a Honeywell 281-2B single channel communications control to transmit over voice-grade lines. The system has been timed at transmission rates of 120 cards or 130 to 140 printer line/min. The printer line transmission rate varies depending on the length of the line, a Honeywell spokesman noted.

One California user has 120s in New York, Washington, and Los Angeles tied to a 635 in San Francisco. A spokesman noted that, before moving up to the 635, the company used a 625 as the central processor in the network. He said the 120 package operated as well in that environment as it does now with the 635.

The company said that it uses its network to extend the engineering design program library and the computing power of the central processor to its regional offices. When the 120s are not being used with the 635, they are used by the regional offices for normal business data processing.

The user told CW that his company was satisfied with the performance of the 120 package. He saw no reason to even speculate on future replacement for the present system.

In a recent demonstration, Honeywell linked a 635 in Washington state to a 120 in Los Angeles that was equipped with the program. When the 120 requested input, the 635 sent a 1,000-card, Cobol program, which was punched out by the 120.

Control cards for the GE operating system were manually combined with the source deck and transmitted back to the 635, where the program was successfully compiled. The source listing, memory map, and object deck were than transmitted back to the 120. The whole process is said to have taken about an hour.

The DP manager for whom this demonstration was arranged told CW that he was pleased with the results – but "not surprised" – since he knew that the 120 package had been operational for some time. He admitted that other vendors had been far less successful in trying to link their equipment with his 635.

Normally, the Honeywell 120 can be linked directly with a wide range of remote devices including teletypewriters, the IBM 1050 Data Communications System, and various Honeywell units. However, the only computers with which it can communicate directly are other Honeywell series systems, and 360 systems equipped with 2701 Data Adapter Units, or 2702 or 2703 Transmission Controls.

Comsec Acts as 'Third Party' Evaluator For DP Managers Who Sell, Buy Packages

KANSAS CITY, Kan. – DP managers who want to either buy or sell tested software packages, or who just want to be kept informed about packages that are available, can use the services of Computer Software Exchange Center (Comsec).

Acting as middleman between seller and purchaser, Comsec said that it provides comprehensive "third party" evaluation of programs submitted to it.

Comsec has published the first volume of abstracts of the packages that it has tested and accepted as part of its software "library." To date, most of the programs have come from private installations and not the professional software houses, a spokesman said.

Free Search Provided

In addition to the abstracts, the center said that it can provide free search for needed software not listed in the publication, and information on packages in process of evaluation at Comsec, or in development elsewhere.

Periodic bulletins to keep software users informed on developments in their areas of interest and nationwide brokerage for both software originators and users are also available, Comsec said.

The examination of programs submitted to Comsec is said to be thorough. The review covers documentation, program logic, I/O formats, and conversion and/or data base generation requirements. A test run is also conducted by Comsec personnel, to confirm the program's accuracy.

The "Abstracts from the Computer Software Library" is a loose-leaf publication which Comsec said will be updated periodically as new programs are tested and accepted. The listings are divided into six categories: systems, utility programs, and "broad based" applications, in addition to general business and manufacturing, specific businesses, and scientific and engineering packages.

Expects Six Volumes

The center expects the library to grow so that, instead of some 70-odd abstracts in a single volume, there will be six volumes, each devoted to one of the categories.

The abstracts reviewed by CW appear well written and well organized. In addition to a narrative description, each shows the major application area, source language, and machine and storage requirements for the program. Logical restrictions and/or timing considerations are included in several cases.

Some of the timings raise as many questions as they answer. Within the payroll area, for example, while test timing for one program was based on 300 employees, a second was based on 1,000 and a third on 2,000 workers. Although times given were precise, they really couldn't be compared. Hopefully, later issues of the abstracts will include uniform test bases.

The abstracts did not give either exact prices or pricing formulas for any of the programs listed.

The publication includes such aids as a "Keyword" or subject index, a "Keyword-in-Context" (Kwic) index, and separator tabs so that the user can move from section to section easily.

The "Abstracts from the Computer Software Library" is available for a yearly deposit of $290. Comsec said that the deposit will be credited in full toward the cost of any software or documentation purchased through the center.

Computer Software Exchange Center Inc. is at One Gateway Center.

Program Allows T/S or Batched Basic

ARLINGTON, Mass. – The 360 users who want to run Basic programs in either time-sharing or batch mode at minimum cost can use the Penny: Basic load-and-go compiler from Schroeder Associates.

With this package, it becomes practical to teach large numbers of people the elements of programming, the company said. Universities and even high schools could afford to teach all their students Basic programming; businesses could teach it to all or most of their employees, the company said.

The company said that the compiler runs under OS/360. It includes a sub-monitor which "batches" many Basic programs in one OS/360 job step. Schroeder said that this "sub-monitor" also includes facilities for limiting execution time and for printing the output of each program.

The package is known as Penny:Basic, Schroeder said, because it will compile a 250-card program for one cent, based on a compiling rate of 125,000 card/min on a 360/65, at $300/hr. On a 360/40, the package is said to have a compile rate of 15,875 card/min, while on a 360/85 it is estimated to have a compile rate of 560,000 card/min.

```
10  GET  X
11  Y=(X+1)/(X-2/3)
12  PUT  Y
13  GO  TO  10

S10    LA    AR1,X
       BAL   AR3,GETROUT
S11    LE    FR0,X
       AE    FR0,CON1
       LE    FR4,CON2
       DE    FR4,CON3
       LE    FR2,X
       SER   FR2,FR4
       DER   FR0,FR2
       STE   FR0,Y
S12    LE    FR0,Y
       BAL   AR3,PUTROUT
S13    B     S10
```

Example of code produced by Penny: Basic.

Schroeder said that these compile rates ware measured with a set of "typical" 100-card programs. All overhead of the compiler was included in the times.

In addition to being efficient, the compiler is said to be re-entrant in structure, and to give good diagnositcs, as well as producing a compact object code.

Penny:Basic is said to have limited core requirements. The compiler itself uses 18K and the associated library uses another 4K. It can work with as little as 3K for work space, according to Schroeder, but will use more core, up to 150K maximum, when available.

The developer said that the compilation efficiency increases with an increase in the work space size. The compiler is available now at a cost of $150/mo for each central processor on which it is used.

Schroeder Associates is at 298 Massachusetts Ave.

System/3 Users' Service Implemented

WHITE PLAINS, N.Y. – System/3 users are utilizing the Application Customizer Service that IBM said it would provide when it announced the system last year.

Initial reports are favorable. One user reported that an inventory clerk who had no prior programming experience coded nine programs in the first week, and completed 30 of 43 planned programs within a month. Another user is said to have completed the systems design and detailed report layouts for three applications in 18 hours.

IBM said that the service starts with the user's completion of a special questionnaire which defines the desired EDP jobs and the format each report should take.

Information from the completed questionnaire is processed by computer at a local IBM Basic Systems Center, to generate a set of cross referencing documents and programming aids such as flowcharts. From these, the user prepares RPG-II specification sheets and compiles the programs on his System/3.

Applications set up with this service have included inventory control, sales projection, accounts/receivables, and orders and billing, according to IBM.

Cost of the service varies. Approximate cost is $185 to $265, plus CPU time at the IBM Center at current rates for each application.

Correction

The article on Precision Artwork Language (PAL) [CW June 10] should have given the address of Automated Graphic Technology Inc. (AGT) as 2 Henson Place, Champaign, Ill. AGT provides software development for users with automated graphics applications.

Canada Net Said to Reach 50,000 Bit/Sec

By Don Leavitt
CW Staff Writer

TORONTO – A high-speed communications network, capable of transmitting data at 50,000 bit/sec, has been made available by Trans-Data Telephone System, even though the company admits that "few organizations can currently use the maximum capacity."

As alternatives, the coast-to-coast Multicom Service provides a rate of 40,800 or 19,200 bit/sec. Regardless of transmission speed, the service also includes voice channels which can be used during data transmission, without disruption.

The company said that the service will be extended downward this fall when a medium-speed capability is implemented. With transmission speeds of 2,400 or 4,800 bit/sec, this is expected to attract many customers who cannot effectively use the high-speed rates.

Trans-Canada said that the high-speed service is being introduced first so that customers would be assured of adequate telecommunications potential as their own operations grow.

CN-CP Has 4,800

A competitor, CN-CP Telecommunications, has had a data transmission capability of up to 4,800 bit/sec, available since 1967 on a nationwide basis. However, a spokesman told CW that CN-CP has no customers for that speed, thus far, although it has "about 500" customers who are using lower speed service.

Trans-Canada said the Multicom Services uses normal telephone lines and transmission equipment, including microwave systems, and switching gear that are part of the telephone companies' network.

Quality transmission is made possible even without the use of dedicated lines, the company said, by using specially wired matrices in connection with the switching equipment.

Any Multicom subscriber will be able to communicate with any other subscribing to the same class of service. The service can be interfaced with any computer in Canada that is equipped for communication, according to Trans-Canada.

The high-speed Multicom Service accepts serial digital signals, and provides synchronous data transmission in full-duplex mode. It transmits at the 40.8-kilobit/sec or 50-kilobit/sec rate on a 48 kHz bandwidth, or at the 19.2-kilobit/sec rate on 24 kHz. Optional features are said to include placing the customer's Multicom station in a permanent request-to-send mode, and internal and external transmitter clocks.

Communications

The medium-speed Multicom Service accepts serial binary signals and provides the same synchronous transmission in full-duplex mode as does the high-speed service. Various mixes of data and voice transmission are possible on this service which operates on a 4kHz bandwidth. Automatic answer mode and a "hot line" that requires no dialing to connect with a receiving station are optional features.

Rate Centers

The high-speed service will have switching centers at Toronto, Montreal, and Calgary; the medium-speed service will include two additional cities – Winnepeg and Vancouver. A series of access points, or "rate centers" beyond the switching centers, will place most of Canada within reasonable phone rates of the Multicom Service, the company said.

Similarly, CN-CP uses five switching centers and some 32 subsidiary concentrators to make its Broadband Exchange System generally accessible to all points in Canada.

Trans-Canada said that it expects to have 10 to 20 terminals in use on the high-speed service within a year, and about 70 within two years. The medium-speed service should have about 600 terminals in use within two years, the company said.

Without the need for dedicated lines, the Multicom user will be charged only for actual usage, on a time-and-distance basis, except for the charge, if any, to the nearest access point.

Trans-Canada estimated that a call between Toronto and Vancouver would cost about $8/min on the high-speed service. Rates for the medium-speed service have not yet been estimated.

Trans-Canada Telephone System is an association of Canada's eight major telephone companies. CN-CP Telecommunications is a joint venture of the Canadian National and Canadian Pacific Railways.

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Cassette Tape Standardization Closer to Materializing

By Frank Piasta
CW Staff Writer

Users of magnetic tape cassettes for computer applications may be able to enjoy the advantages of industry standardization if current plans materialize.

At the present time, the user is faced with a bewildering variety of recording techniques, tape speeds, and bit densities. The recording techniques vary from those used in open-reel tape drives, to some that are, at best, adaptations of audio recording techniques.

Recording Techniques

Current data recording on 1/2 in. tapes uses primarily one of two techniques. One of these, phase encoding, is a technique originally introduced with IBM's 1,600 bit/in. tape drives.

In this method a 1 is represented by a positive change in the writing current, while a 0 is represented by a negative change. An additional current reversal is inserted whenever a 1 is followed by another 1, a 0 is followed by another 0. This requires that a tape used at a given density be capable of recording up to twice as many magnetic flux reversals per inch as the packing density. For example, 1,600 reversals per inch would be required for a 800-bit/in. recording.

Prior to the introduction of phase encoding, the technique used in all IBM tape drives, and all IBM-compatible drives as well, was NRZI (Non-Return to Zero, IBM). It is still used in the majority of tape drives. In this method the direction of the writing current is reversed every time a 1 is to be recorded.

Therefore, a 1 is represented by either a positive or negative pulse, while a 0 is represented by the absence of a pulse. A disadvantage of this method lies in its inability to distinguish between a 0 and the lack of data.

Other techniques in use are double-track phase encoding, dual-track NRZI with inverted data on the second track, and NRZI with a second track with a prerecorded tachometer signal. Other formats include mechanical configurations requiring the removal of the pressure pad from the cassette prior to use, different density recordings, etc.

First Step Taken

At a meeting last month in Milan, Italy, of the European Computer Manufacturers Association (ECMA), a significant first step was made to untangle this mess of recording techniques. 'On a proposal by Philips of Holland, the originator of the Norelco-type cassette,' preliminary approval was given to the use of a phase-encoded single track format as the industry standard. Recording density in the specification was 800 bit/in., using 750-microinch tape.

Digitronics, a subsidiary of Philips of North America, is scheduled to introduce similar standards to Bema and Ansi in this country.

Industry support of the move is shown by the composition of the ECMA which includes Mastertape, NCR, and ICL of Great Britain; Olivetti and General Electric of Italy; Siemens, Ampex, Nixdorf, BASF, Olympia and Ankerweke of Germany; IBM and Bull Berfort of France; Friden and Philips of Holland; and Facit of Sweden.

The adoption of the European standard here has already been urged by Ampex.

A spokesman for GE said that his company had left the question of cassette standards in the hands of the European GE personnel. He said that there seemed to be little doubt that his company would favor the standard.

Other industry spokesmen have agreed that standards for recording formats are needed for physical description of cassettes and to provide a basic framework for data interchange.

Preprocessor Combines On-Line Inquiry, Voice Response Into One Data System

STAMFORD, Conn. – A communications system from Dash Data Systems, Inc. that combines the features of on-line inquiry through computer-generated voice response and remote terminal data transmission into one common system uses Touch-Tone techniques or acoustically coupled terminals for input.

Called the Dash-11, the system incorporates a Programmable Director which is said to have all the capabilities of a small, general-purpose computer to control its basic functions.

The ability of the director to preprocess data and perform overall communications control, Dash Data said, relieves the main computer of the software and timing burdens normally associated with these on-line functions.

1,024 Words Maximum

The basic Dash-11 system is supplied with two lines and a vocabulary of 32 words. The system may be expanded to a total of 64 lines and a maximum vocabulary of 1,024 words, expandable in modules of 32 words.

The Dash-11 may be configured as a stand-alone system as well as an on-line system. Interfaces are available for the IBM 360, Univac 1108 and 494, and the RCA Spectra series. Other interfaces are available on an RPQ basis, the company said.

The Dash-11 system is primarily a remote inquiry voice response system, but it can optionally be configured to handle data communications between remote terminals such as CRT displays, teletypewriters, or other batch-oriented transmission devices.

The Programmable Director provides overall control of the system and may be equipped with from 4K to 32K of memory, in increments of 4K. Memory speed is 1.8 μsec. The basic executive control programs are standard; application programming is available as an option. The instruction repertoire consists of 107 standard instructions and 200 microinstructions, according to Dash Data.

Off-line Disk Interface

The system includes a digital multiplexer to handle the communications lines, data set controllers, a voice generator, and audio multiplexer. In addition to the computer interface, an off-line disk interface with a capacity of up to 7-million bytes is available. Interfaces to connect a magnetic tape drive with IBM-compatible 7- or 9-track, 556 or 800-bit/in. capabilities are also available.

The basic Dash-11 system with a 32-word vocabulary and two 403-type line modules, 8K bytes of memory, and a console printer and keyboard is priced at $43,450.

Each 32-word vocabulary increment is priced at $4,500, and each additional line module would cost either $1,000 or $2,050 for the 403 type or 202 type of module, respectively. Each additional 8K bytes of core is priced at $9,750.

The cost of the 360-compatible channel interface is $9,500. Prices for other interfaces are available from the manufacturer.

First customer shipments are expected to be made this fall. Current delivery schedules are 120 to 160 days.

Dash Data Systems, Inc. is at 69 Jefferson St.

Mini + Selectric + Cassette = Intelligent Terminal

CONCORD, Calif. – Combining a minicomputer and a Selectric typewriter, with tape cassette handling, the Eldorado 133 can function either as an intelligent terminal or as a stand-alone computing system.

The 133 is part of a series from Eldorado Electrodata Corp. that includes the Model 101 off-line data terminal, the Model 102 on-line data terminal, and the Model 109 data converter.

Said by the manufacturer to complement rather than compete with large-scale data processing systems, the 133 can be programmed by the user to perform most of the usual business applications.

The minicomputer that is the heart of the 133 has a cycle time of 1.1 μsec. Core memory is expandable from 4K to 32K bytes. Also included is a ROM with a speed of 220 nsec/word. A 16-bit word is used in the ROM, which is expandable from 768 to 1,024 words.

Six Registers

Six operation registers are incorporated in the unit. These include: accumulator, auxiliary accumulator, index, program counter, overflow, and word-length control.

Multiprecision 1-, 2-, 3-, or 4-byte load, store, and arithmetic operations can be performed. Access is direct memory.

Programmed transfers to and from A/B registers and memory can be performed concurrently with a buffered I/O operations, the firm said. A priority interrupt system with eight external interrupts can be expanded to 64.

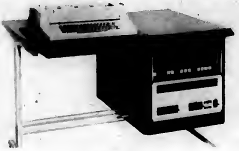
The instruction set consists of 89 operations, including multiply and divide, and multibit arithmetic and logical shifts in addition to the usual complement of instructions. Direct, indirect, indexed and extended operations addressing modes are provided.

The Model 133 is equipped with a three-deck cassette-type tape recorder. Using standard Norelco-type cassettes (TDK CS-60), the data is recorded at 500 bit/in. resulting in a capacity of 180K char/cassette. Read and write speeds are 400 char/sec. Tape rewind time is 45 seconds for 150 ft of tape. File protect is provided as well as start of tape and end of tape sensing.

The principal I/O device is a standard Selectric typewriter that has a paper capacity of 15-1/2 in. with a line width of 13 in. with 10 char/in. A pinfeed platen, allowing paper feed registration when using continuous forms, is available as an option.

User Programming

Software available allows the user to do his own programming. It includes a Symbolic Assembler, Tape Editor, Bootstrap Loader, Debugging Package, and an Executive that provides I/O supervision, object time diagnostics, and job-to-job transition. These programs are all cassette-resident. A card resident Symbolic Cross Assembler, coded in Fortran, allows the user to utilize any Fortran-equipped computer to generate programs for the 133.



Eldorado 133

In addition to the Selectric-equipped, Business Office Computing configuration, the 133 is available in a plotter-equipped, Data Graphics model. A concentrator and remote data collection model that is equipped with a communications interface can be time-shared by other terminals. This model is capable of handling up to 75 lines at rates up to 9,600 bit/sec.

The price of the 133 Business Office Computing model is $22,500. It is available on a 30-day schedule.

The Model 101 off-line data terminal consists of a Selectric typewriter used to record data on cassettes, while a hard copy is printed. It is available on a 60-day schedule for $3,750.

The Model 102 on-line data terminal, in addition to the features of the 101, includes a magnetic tape playback cassette unit and a modem for transmission of the recorded data. This may be done under control of the operator or when polled by a remote computer. High-speed burst transmission and conversational on-line capability are optional. The price of the Model 102 is $4,450, and it is available on a 60-day schedule.

The Model 109 data converter can read cassette tapes and copy the data to IBM-compatible, 800 bit/in., 9-track, 1/2 in. tapes on 8-1/2 in. reels. The price is $9,500, on a 60-day schedule.

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NCR 720 System Provides Reports at Remote Site

DAYTON, Ohio – Designed as a system to generate data tapes for telephone-line transmission to a computer center, the NCR 720 system allows reports to be generated at the remote site on a line-printer.

The system is intended for small banks as well as branch operations of larger institutions. The NCR 720 allows these users to utilize computer processing with a minimum equipment investment, while retaining the original documents at their local office.

Systems/ Peripherals

Owen B. Gardner, NCR vice-president, said: "A large percentage of the nation's commercial banks to date have not been able to take full advantage of computer efficiencies, due mainly to transportation limitations, the desire to retain control of bank documents, the shortage of adequately trained electronic data processing staffs, and equipment costs.

"With the advent of the 720, banks of any size can enjoy these benefits from either a remote location or as a satellite of a large computer installation," he added.

The system requires only four electronic units in the bank itself: the 404-720 Micr reader/sorter, the 735 or 736 magnetic tape encoder, a 640-720 high-speed printer, and a 720-301 communication controller unit.

System Operations

The system operates as follows: as bank business is transacted, documents from proof machines and encoding equipment are entered into the 720 system. The system captures the magnetically encoded data from these documents at the rate of 400 to 600 document/min.

Data from valid documents is captured on magnetic tape, while reject items are distributed to the electronic sorter's reject pocket for further processing, the company said.

Savings, installment loans, mortgage loans, or credit-card transactions that are not magnetically encoded can be entered directly through the magnetic tape encoder.

Periodically during the day, the totals of items are printed from the magnetic tape and balanced. Rejected items are reconciled with the totals and then entered on the tape through the encoder.

This provides a reconciliation of all items prior to transmission of the magnetic tape data to a correspondent bank or outside data processing center, the firm said. The bank's documents remain on the premises where they are fine-sorted by the sorter and filed.

Computer-created management reports from the central computer are transmitted to the NCR 720 system and printed out at the bank.

The system was developed under the guidance of bankers who require accurate, automatic input of Micr-encoded documents, complete reconciliation and balancing, fine sorting, operating simplicity, transmission/transportation and print-out capabilities, flexibility to handle miscellaneous inputs, and low cost, NCR said.

There are over 4,500 banks now contracting for off-premise work that could utilize the 720 system, according to the firm. NCR said the 720 can be used with any central computer system.

The cost for the NCR 720 is $1,950/mo on a three-year rental, $2,175/mo on a one year rental. The system can be purchased at $75,000.

The 720 will be available for delivery the first week of July.

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1970 Communications and Terminals Supplement

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A look at the Bell System. What services are available and what types of equipment? What combinations of service can Bell offer to compete with the independent vendors .... Page S/2

The Compleat Guide to Moderne Communications

A complete guide to communications systems and the tradeoffs users must consider when designing and building such systems. What parts of the system must be designed in what order? What are the decision points for the company and the system designer? .... Page S/4

What Are Effects of the Carterfone Decision?

A landmark for communications users — The Carterfone Decision — is examined as it has been put into effect. The FCC has changed its way of handling cases as a result of this decision. How does this change affect users? What are the options for users now? ... Page S/7

Special Communications Problems of the 360

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Pick One: Cheap and Dumb, or Smart and Expensive

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When to Use a Communications Consultant

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A limited number of additional copies of this supplement are available at 20 cents each. CW pays postage on prepaid orders. Send requests to: Circulation Manager, Computerworld, 797 Washington St., Newton, Mass. 02160

Many Classifications

Bell Services, Equipment Offer Bewildering Array

By Ronald A. Frank
CW Technical News Editor

The user who is considering a communications system is faced with a bewildering array of data services and equipment, just from the Bell System.

Basically, Bell offers three types of services classified by speed – low, medium, and high. These three types can also be classified as sub-voice, voice-grade, and wide-band.

Low-speed or sub-voice grade lines generally have a transmitting capability ranging from 45 to 200 bit/sec. Teletypewriters which operate at speeds from 45 to 150 bit/sec would be the main type of data equipment operated on low-speed lines. Paper tape punches operating with teletypewriters at about 75 bit/sec would use this type of service.

The majority of data communications users utilize medium-speed or voice-grade services. These lines generally have a transmitting capability ranging from 600 to 4,800 bit/sec. A wide variety of computer compatible data equipment operates on voice-grade lines. Among these are low-speed devices like card readers and punches (1,500 to 4,000 bit/sec), printers (1,200 to 4,500 bit/sec), magnetic tape drives (150 to 4,800 bit/sec), and paper tape readers and punches (800 to 4,000 bit/sec).

High-speed or wide-band lines are compatible with high-speed devices such as CRT displays which can operate at 8,000 bit/sec, tape drives which can operate at speeds up to 2 million bit/sec, disk drives which can operate at speeds up to 2 million bit/sec, drum storage units which operate at speeds up to 8 million bit/sec, and central processors which can operate at 16 million bit/sec. These rated operating speeds are academic in many cases, however, since practical transmission line speeds are 2,400 bit/sec (with some use of 3,600 bit/sec) on voice grade lines and up to 500,000 bit/sec on wide-band lines.

A further distinction in types of data lines exists in that both switched and leased lines are available. For high-speed applications Bell makes available conditioned line facilities which specify maximum allowable noise levels making them more favorable for computer data.

Conditioned Lines

Bell currently offers three types of conditioned lines. These are classified as C1, C2, and C4 conditioning (C3 is also available for certain types of switched services). Generally speaking, higher speed lines require greater conditioning, and cost proportionately more to the data user.

As an example, conditioned lines on voice-grade services would cost about $5/mo for C1 conditioning, and up to $30/mo for C4 conditioning. These rates would be charged over normal line charges and unless utilized for a high percentage of time could be prohibitive for data users operating with limited budgets.

Since switched lines make use of the public telephone network to transmit data, this type of service is usually less expensive for users than leased or private line facilities.

Users who normally transmit a high volume of data on a regular basis can utilize Telpak services, which are able to handle up to 240 voice channels operating in full duplex (simultaneous transmit and receive) mode. Telpak offerings are currently available at two levels: Telpak C with a capacity of 60 voice channels operating at a total speed of 240,000 bit/sec and Telpak D with a capacity of 240 voice channels operating at a total speed of 500,000 bit/sec.

Modems Necessary

Since computer data is digital and the Bell System is basically an analog network designed for voice or nondigital data, it is necessary for computer data users to convert their digitally formatted information into analog with a Modulator/Demodulator or modem.

Bell offers a reasonably complete line of modems for use on its various tariffed services. These modems (or Dataphones, as Bell calls them) are available in four main series.

The 100 Series data sets are designed for low-speed operation on both switched or leased voice-band lines. These sets operate at up to 300 bit/sec and rent for about $20 to $25/mo.

The 200 Series data sets operate at speeds up to 3,600 bit/sec on the switched network and up to 2,400 bit/sec on leased lines (with C2 conditioning). They rent for about $14 to $210/mo.

The 300 Series data sets are not designed for operation on the switched network. These sets operate on leased lines using wide-band facilities at speeds up to 230,400 bit/sec. Monthly rentals depend on local tariffs and terminal charges.

The 400 Series data sets operate over the switched network at speeds up to 75 char/sec and over leased lines st speeds up to 2,400 bit/sec (with C2 conditioning). The monthly rental ranges from $5 to $75/mo.

Most monthly rental charges do not include initial installation charges which vary according to tariffs that apply in specific geographic areas and type of service required for transmission.

In general, interstate tariffs are fixed by the Federal Communications Commission while intrastate tariffs are fixed by the state public utilities commissions or their equivalents. Some exceptions do exist such as in Texas, which has no state regulatory agency. In such areas, local governing bodies are empowered to fix tariffs.

Non-Bell Equipment

As a result of the Carterfone Decision, users can operate non-Bell equipment on the switched network. In these installations the user is still required to obtain a Data Access Arrangement (DAA) device from Bell. These units, which Bell says are required to control network signaling functions, and are designed to prevent harm to the network, can range from less than $10 up to $20 depending on type of

(Continued on Page S/8)

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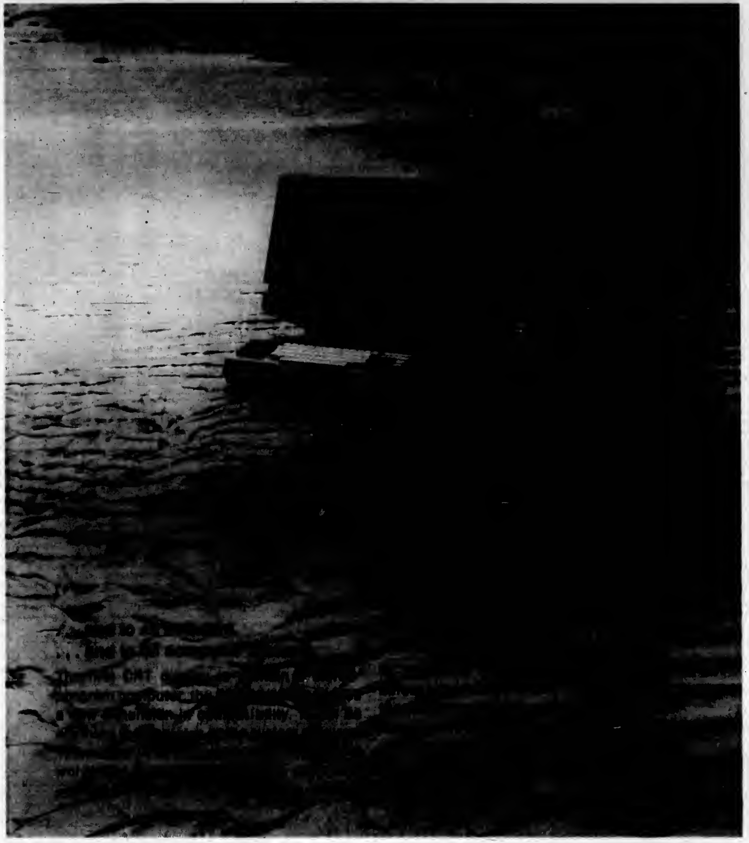
HOUSTON, Texas – A multiplexer which enables 2,400 baud data channels to be multiplexed into 4,800, 7,200, or 9,600 baud line systems, with no modification to low-speed equipment necessary, has been introduced by Communications Logic, Inc.

Called the Stream Multiplexor Model SMV-1, the unit is designed to work with any manufacture multiplexers or batch terminals which generate synchronous data streams.

Communications Logic is at 6400 Westpark, Suite 355.



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How to Evaluate Communications

Users Must Consider Tradeoffs Between Approaches

By Arthur L. Wilkes
Special to Computerworld

Until quite recently electronic data transmission was still in the same rudimentary state it was a century ago – a green eye-shade, a telegraph key at one end, a clacker at the other, and a simple transmission line that carried dot-and-dash signals between.

With the advent, first, of automatic typewriters operated by telegraph signals (the teleprinter) and subsequently of electronic computers, the world of data communications was precipitated into a radical change.

Today's sophisticated data communications systems, already interplanetary in scope and yet still unlimited, are the visible result.

Like the abacus of ancient China, the computer which we know today was intended originally to be used for in-house data processing – rapid computation to relieve the one-by-one manual processes of arithmetic.

Unfortunately, but perhaps not surprisingly, costs proved so great at the outset that smaller companies were unable to bear the expense of this progress, while larger, more financially able organizations utilized computers only at major locations, on a relatively restricted basis. The process consisted of an operator feeding information into a machine and getting information back. On the batch level, this was a one-on-one operation (one person on one machine) about 1951.

The self-limiting aspects of such batch computer systems were obvious, as was the necessity for new development. Out of this came the invention of time-sharing computer systems, whereby several users at the same or different locations could use one machine, all at the same time (about 1967).

Through use of time-sharing systems, smaller companies would be able to share the relatively high cost of individual computer installations, and larger companies – airlines, for example – could share centralized computers at their many locations.

Now, yet another new need emerged – the need for machines to communicate with other machines.

In an effort to serve this need, companies selling time-sharing services designed their systems on the premise that the best way to solve this communications problem was to have many computers located in all areas of the country connected by local telephone lines.

This approach, although good in theory, proved not to be very functional. The expense associated with separate computers, supervisors, programmers, operators, large amounts of floor space, and necessary air conditioning at each computer location caused economic problems that severely limited the services that could be offered by a network composed of many sites with undersized computers.

Telephone Problems

Thus the time-sharing companies began reducing the number of locations while increasing the capabilities and services available at the remaining locations with larger more powerful computers. This approach utilized other telephone facilities such as long-distance lines.

The cost of such telephone facilities and their susceptibility to errors due to inappropriate design, once again, created new problems.

As competition in the computer time-sharing field emerged, so did the need for economical, yet efficient and reliable, data communications equipment.

Today's data communications sys-

(Continued on Page S/5)

1. RELIABILITY
2. ERROR RATE
3. CAPACITY
4. THROUGHPUT
5. EXPANDABILITY
6. MAINTAINABILITY
7. SYSTEM COMPATIBILITY

VS. COST

COMBINING DEVICE

EQUIPMENT FEATURES		SYSTEM FACTORS
1. NUMBER OF CHANNELS	VS.	COST THROUGHPUT DELAY MAINTAINABILITY
2. CAPACITY	VS.	COST RELIABILITY COMPUTER Q ERROR RATE EXPANDABILITY
5 STORAGE	VS.	COST THROUGHPUT DELAY COMPUTER Q
4. ERROR CONTROL	VS.	COST ERROR RATE FACILITY RELIABILITY DELAY THROUGHPUT
5 VARIABLE LOW SPEED INPUT	VS.	COST FACILITY COST LOW SPEED MODEM COST
6 MULTIPLE HIGH SPEED OUTPUTS	VS.	COST HIGH SPEED MODEM COST FACILITY COST NUMBER OF POINTS
7 TYPE A BIT/BYTE B FDM/TDM	VS.	ERROR RATE EXPANDABILITY CAPACITY DELAY

TRANSMISSION DEVICE

EQUIPMENT FEATURES		SYSTEM FACTORS
1 SPEED	VS.	RESPONSE TIME COST FACILITY COST ERROR RATE MAINTAINABILITY
2 ERROR CONTROL	VS.	DELAY THROUGHPUT COST FACILITY RELIABILITY
5 EQUALIZATION	VS.	FACILITY RELIABILITY SPEED ERROR RATE COST DELAY FACILITY COST

COMMUNICATIONS PROCESSOR

EQUIPMENT FEATURES		SYSTEM FACTORS
1. STORAGE	VS.	COST CAPACITY TRANSMISSION COST LABOR COST PROGRAM COST
2 SPEED	VS.	COST LABOR COST CAPACITY RELIABILITY MAINTAINABILITY
3. CPU INTERFACE	VS.	COST SPEED DELAY PROGRAM COST
4. MESSAGE SWITCHING ABILITY	VS.	SPEED TRANSMISSION FACILITY COST LABOR COST PROGRAM COST RESPONCE TIME
5 INPUT/OUTPUT CAPACITY	VS.	COST USAGE MAINFRAME CAPACITY MAINFRAME SPEED

TRANSMISSION FACILITY

EQUIPMENT FEATURES		SYSTEM FACTORS
1 CAPACITY (SPEED)	VS.	FACILITY COST ERROR RATE RESPONSE TIME
2 NUMBER OF STATIONS	VS.	FACILITY COST RESPONSE TIME THROUGHPUT DELAY
3 COST OF TRANSMISSION DEVICE	VS.	FACILITY COST THROUGHPUT SPEED ERROR RATE MAINTAINABILITY
4 DIAL-UP FACILITY	VS.	TIME ON LINE (COST) ERROR RATE RELIABILITY
5. PRIVATE FACILITY	VS.	TIME ON LINE (COST) MOBILITY RESPONSE TIME

TERMINAL

EQUIPMENT FEATURES		SYSTEM FACTORS
1. HUMAN INTERFACE A GENERALIZED (STANDARD KEYBOARD) B. SPECIALIZED GRAPHIC, CASH REGISTER, ECT) C FORMATTED	VS.	ACCURACY RESPONSE TIME LABOR COST
2 STORAGE A INTERNAL B EXTERNAL	VS.	TRANSMISSION COST ACCURACY
3 SPEED	VS.	TRANSMISSION COST COMPUTER Q LABOR COST RESPONSE TIME
4 CODE FOR DATA TRANSFER	VS.	EXPANDABILITY SYSTEM COMPATIBILITY

Communications Component Evaluation Chart

Tradeoffs Users Must Consider in Communications

(Continued from Page S/4)

tem – responsive to this need – is comprised of five basic sections:

- Terminals
- Data combining devices
- Transmission facilities
- Transmitting and receiving devices
- Communications processors

Each section plays an important role in the ability of centralized computers to collect and disseminate large amounts of data to and from remote points for the least expensive method in a minimum period of time.

In order to communicate with each other, these sections must always be compatible in speed and interface, and usually in the code for data transfer and formatting, depending upon the involvement of each in the total system.

Factors such as data transfer capacity, ease of maintenance, cost, data error rates, system expandability, and human interface (man's adaptability to the machine are of prime importance in the overall design of the system.

The accompanying chart on Page S/4 depicts the exchanges or "tradeoffs" which are inherent in considering the overall design of a total system.

For example: The capacity of each section should be sufficient to handle the tasks it is assigned; the incremental cost of each should be weighed against adding additional features to other sections of the system to perform the same function. All factors are interdependent and overall system requirements should be checked against each individual section within the system.

Each section of the system has its individual idiosyncracies. For a system designer to get an accurate perspective of the entire system to be created, he must take fully into account the restrictiveness of these idiosyncracies.

Transmission Medium

The transmission facility usually is a telephone line. By design and purpose, this is basically a voice-transmission medium. It is the most restrictive section in the data communications system and, because of this, it is the paramount consideration in establishing the foundation on which most data communication systems are built.

Because the average human voice has a frequency range of between 300 to 3,000 Hz, transmission facilities are designed to handle only this 2,700 Hz bandwidth. All other bandwidths in use today are either a grouping of or a sub-dividing of the original. Not only is the bandwidth limited, but such things as noise, attenuation, phase delay, fading, and echoes were not considered to be drastic problems until they became intolerable.

Unfortunately, these conditions which are tolerated by humans are not tolerated by machines. Thus, the designer of a data communications system becomes restricted to three primary types of transmission facilities: low-, medium-, and high-speed. All of these speeds are available in either dial-up service or on private lines.

A dial-up line is a transmission facility which can be accessed by use of a dial on a telephone that calls up the next open line at the central telephone exchange.

A private line is permanently connected between (at least) two points and is for the sole use of the subscriber. Unlike a dial-up facility which is restricted to two-point operation, a private line can be designed to have many stations.

The cost of a dial-up facility is determined by a combination of distance and time used on each individual call, whereas the cost of a private line is computed by distance, leased on a monthly basis, whether used once a month or once each hour (Figure 1).

Channel Speed	Available Bandwidth (Hz)	Speed (Bit/Sec)	Private Line Approximate Cost/1,000 Miles*	Dial-Up Line Approximate Cost/1,000 Miles*	Economical to Switch Point**
Low	200	15 to 150 max	$796/mo	$2.63/5 min	37 hrs, 31 min
Medium	2,700	50 to 3,600	$1,193/mo	$2.63/5 min	51 hrs, 39 min
High	48,000	50,000 max	$10,125/mo	$13.71/5 min	6 hrs, 37 min

*Interstate Rates

** For a 1,000 mile transmission facility it becomes economical to use a private line when the total monthly time spent exceeds these times.

Figure 1. Cost Comparision of Private Line/Dial-Up Line

Therefore, the total time spent communicating between two specific points during a given month must be computed to determine which transmission facilities would be more economical. But before a definite selection of a transmission facility may be made intelligently, other factors must be explored, such as reliability, capacity, and delays:

For example, the reliability of a dial-up facility is severely hampered by the fact that each time a call is placed a different transmission path with varying characteristics is called into use.

On the other hand, because a private line is permanently connected, reliability is more consistent.

To allow for data transmission speeds greater than those described, the common carriers have combined a number of high-speed transmission facilities into two groups, one of 60 channels the other of 240 channels. The latter group is capable of transmission rates up to 500,000 bit/sec.

Transmitting/Receiving

Before data can be sent over these voice-oriented transmission facilities; the data must first be converted from the original yes/no digital form which is the basic machine language, to something that appears in similar form to the human voice. Once it has been transmitted, it must be converted back to its yes/no digital form so it can be received and understood by terminals, computers, and peripheral equipment.

This conversion is accomplished through the use of a transmitting/receiving device, which is commonly referred to as a data set or modem.

The ability of a transmitting/receiving device to transmit over the worst possible transmission facility at the highest rate with the least amount of errors is a major factor in the overall performance of a data communications system.

To be able to select a transmitting/receiving device, the system designer must first know at what rate or speed the transmission will take place. This rate or speed establishes the basis for selecting a proper transmitting/receiving device. Once the rate of transmission has been determined, such things as cost, reliability, maintainability and error rate of the device must be established. Exchanges or "tradeoffs" are made in each of these areas to gain the most desired features for the least cost.

The excessive noise, attenuation, fading, and phase delay, all of which are inherent to voice-oriented transmission facilities, increase with the transmission rate.

Because it interfaces with these transmission facilities, a transmitting/receiving device must in some way adjust for the conditions. This adjustment generally takes the form of equalization – a compensation for the disturbances.

Decision Parameters	Type of Multiplexing		
	Byte	Bit	Frequency
Capacity Most Possible Channels	Most	Next	Least
Error Multiplication Per Channel	Low	High	Highest
Cost Per Channel with Communications Processor	Least: 6 and up	Next	Greatest
Cost Per Channel			
2-9 Channels	Greatest	Next	Least
9-18 Channels	Next	Least	Greatest
18-up Channels	Least	Next	Greatest
Ease of Multipoint Operation	Next	Worst	Best
Ease of Maintenance	Good	Good	Poor
Ease of Expandability	Good	Good	Poor
Operating Ease Directly Into a Communications Processor	Good	8-10 Times Harder	Almost Impossible
Need for Modems	Yes	Yes	No
Automatic Baud Rate Detection	Yes	Yes	Yes
Throughput Delay	Greatest	Next	Least

Figure 2. Multiplexer Comparison

Equalization

Equalization may be a manual process of measuring the transmission facility and adjusting the device, a semi-automatic process of opening the device and pushing a button, or a fully automatic adaptive process.

In the fully automatic adaptive process the receive portion of the device continually monitors the incoming voice-line signal and automatically makes internal adjustments to adapt to the changes that occur.

Because transmission facilities are not always stable, a transmitting/receiving device which continually adapts itself to the changes that occur is apt to perform more consistently than a manual or semi-automatic device.

However, equalization cannot compensate for such things as line hits (electronic interruptions), clicks from switching in the common carriers' offices, or excessive noise, all of which can cause a momentary interruption of the entire data stream. This interruption, which is generally referred to as a burst error, can be compensated for by using certain error control techniques.

There are two forms of error control in general use today: retransmission, and forward error detection and correction.

In retransmission, a block of data is transmitted from one point to another. The receiving device checks the incoming data for errors; if none are present, it will inform the transmitting device to send the next block. Should errors be present, the receiver will inform the transmitter to retransmit the original block. In many systems, retransmission will be attempted three times. After the third attempt the system will stop transmission with this location and signal an alarm at the transmitter. This is true whether it receives an error in a single bit or many bit errors in a data block.

Error Detection, Correction

On the other hand, forward error detection and correction appears simpler to the user even though it is more complex in design.

To make forward error detection and correction possible the effective data rate, or throughput, is decreased. The difference between the old effective data rate and the new effective data rate is then used to transmit a coded data pattern. It is from this pattern that the receiving device can determine where errors were made, if any, and how to correct them.

Through an independent set of tests it has been determined that most burst errors are of 1- to 5-msec in duration. A transmitting/receiving device with good forward error detection and correction can correct virtually all errors of this duration.

Because of the high cost of transmission facilities and the necessity for transmitting/receiving devices, the need to

(Continued on Page S/6)

Tradeoffs Users Must Consider in Communications

(Continued from Page S/5)

utilize these five sections fully is apparent.

It is because of this need that data combining devices were developed; the most widely used techniques are:

- Byte or character-interleaved, time-division multiplexers (byte TDM).
- Bit interleaved, time-division multiplexers (bit TDM).
- Frequency-division multiplexers (FDM).

Basically all multiplexers serve the same purpose. They are designed to combine two or more data streams for transmission down one transmission facility. The accompanying chart describes the exchanges made in selecting one type in lieu of another.

Data combining devices have been in use by common carriers for many years. A typical example is the common carrier's ability to subdivide (or multiplex) a medium-speed transmission facility in order to obtain many low-speed transmission facilities.

A combining device may be hardwired, such as a frequency division multiplexer, or may be programmable, such as a remote intelligent satellite. In either case, the ability to multiplex has demonstrated the economy of large computer centers.

A well documented example is the time-sharing industry's placement of a computer center in one, two, or three of the existing megalopolises. Large-scale, multiplexed systems are then connected to these centers.

In addition, the computer centers are interconnected through the use of high-speed transmission facilities and high-speed transmitting/receiving devices. The expenses incurred in transmission facilities, transmitting/receiving devices, and combining devices are more than offset by the reduction of personnel, rents, and air conditioning costs associated with many-sited computer operations.

Service provided to the user is improved due to a larger central processor with its increased computation ability and faster access time and extended storage capability.

Economics

Economics are but one factor in the selection of a data combining device. Also essential are areas such as allowable error rates; throughput delay; variable, low-speed input rates; and multiple, high-speed outputs.

For example, one of the major disadvantages of computer centralization is an increase in data communication error rates. This disadvantage, however, must be weighed against the overall reduction in total system cost.

The communications processor is the most expensive individual section of the system. A communications processor can operate as a data message switcher or as a computer "front-end" communications controller, or as a combination of both.

As a data message switcher, a communications processor will poll a network of terminals, store the messages received, and retransmit the stored messages to their proper destinations.

In addition to transferring messages, the switcher can dial remote stations or accept incoming calls from remote stations via the common carrier's switched-message network. Further it can log all messages and provide traffic load studies.

Operating as a computer communications controller, a communications processor will provide access for a terminal to communicate with a host mainframe computer. Generally, a computer communications controller will also establish an identifiable communications link between the combining device and the host computer.

Communications processors, like data combining devices, are either hardwired or programmable. Because of its basic design, a programmable device is more flexible than a hardwired device. It also is more readily adaptable to a change in its environment, such as the addition of newly designed equipment.

The primary function of all terminals is to interface the "individual" with the data transmission system.

Variety of Terminals

Nonetheless, the variety of terminals available is almost endless. There are many types and sizes performing different functions, at different speeds, and available of course at different costs.

- They can transmit at a single data rate or at multiple data rates.
- They can send one code for dsta transfer (such as Ascii) or multiple codes for data transfer (such as Ascii correspondence and EBCD).
- They can function at low speed or at high speed.
- They can receive data in many forms: magnetic tape, punched paper tape, page copy disk, and video.
- They can prepare either punched tape or magnetic tape for future transmission at the terminal's optimum speed.
- They can interface the individual at different levels of operation, such as on-line and off-line.
- Information received by the terminals can be disseminated among many individuals or to a single individual.
- Some terminals, such as the video display unit with batch transmission capabilities, have internal storage for future transmission.

Obviously, the wide variety of available terminals presents wide choice. Each type offers some advantage and possibly some disadvantage.

If there is confusion, it csn be offset by the designer's caution and care in designing the system.

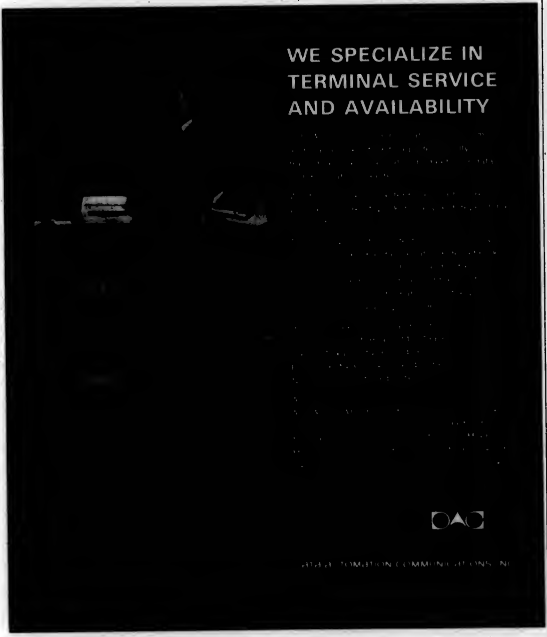
The sections when combined with a central computer make up the total system and each section can, and is, provided by any number of vendors.

Unfortunately, each time a vendor is added to a system, maintenance becomes more complex.

Today's more contemporary approach is towards the "three-vendor system" – the central processor manufacturer, the common carrier, and the data communications equipment manufacturer.

By use of the three-vendor system, a designer will not only be more amply assisted in the design of the system, he will be able to increase the maintainability.

Arthur L. Wilkes is president of American Data Systems. ADS manufactures a complete line of communications systems and components.



Challenge to Continue Momentum

Carterfone Decision—A Communications Landmark

By Ray Besing
Special to Computerworld

Two years have now passed since the FCC issued its Carterfone Decision, which held that the interconnection and foreign attachment provisions of the AT&T tariffs were illegal.

The impact of the decision has now become more fully realized and there is a general consensus in the communications industry that the decision and its necessary consequences represent perhaps the most significant breakthrough in communications policy in the history of the industry.

The 1957 Hushaphone Decision was the precursor of Carterfone but the comparative impact of the two cases on the industry has been entirely different. In the Hushaphone case, the commission reluctantly complied with the order of the District of Columbia Court of Appeals in requiring AT&T to amend its tariff to permit the use of certain customer-owned devices.

However, the "amended" tariff filed by AT&T with the FCC did not comply with the commission's order and, in fact, represented a careful and rather clever subterfuge. The tariff appeared to permit customer-owned equipment to be used with the telephone system as long as such equipment was harmless but then AT&T added to the foreign attachment section of the tariff a phrase which prohibited all "interconnection."

The commission, without comment or objection, simply permitted the amended tariff to become effective.

How Effective?

In substance, Hushaphone did not accomplish what it should have accomplished, and AT&T was successful in being able to maintain and, in fact, extend its unlawful equipment monopoly under the protection of the amended tariff provisions.

In 1965, this writer filed an antitrust suit against AT&T in the U.S. District Court for the Northern District of Texas on behalf of Tom Carter and Carter Electronics Co., alleging that AT&T had, under the guise of an illegal tariff, used its monopoly power to drive Carter and his company out of business in the manufacture and sale of the Carterfone.

The Carterfone was an acoustic-inductive coupler which permitted two-way conversations between a party on a telephone line and another party in a vehicle equipped with two-way mobile radio.

AT&T and the operating companies of the Bell System did, indeed, have a lawful monopoly as to the furnishing of a telephone service.

It was Carter's position, however, that the telephone company's lawful monopoly had been unlawfully extended into an equipment monopoly wherein the Bell System required all telephone subscribers to use only telephone company-provided equipment on the customers' premises, and expressly prohibited all customer-provided equipment, regardless of quality, usefulness, price, or function.

Blanket Prohibition

The interconnection tariff was, therefore, a blanket prohibition against the customer's right to use whatever equipment and devices he chose.

The case was transferred to the FCC and lengthy hearings were held in April, 1967. The Bell System could produce no evidence of actual harm caused by the Carterfone device and their witnesses could only repeat over again that since customer-owned equipment might cause harm, all such equipment must be prohibited.

In June, 1968, the FCC rendered its final decision, firmly establishing the principle that the telephone subscriber is entitled to use whatever equipment he pleases provided it does not cause actual, as distinguished from potential, harm to the telephone network and the members of the public using the telephone network.

AT&T again, as in the Hushaphone case, attempted to emasculate the effectiveness of the Carterfone Decision by filing new tariffs in late 1968 which only appeared to open up the network to customer-owned equipment when, in fact, the new tariffs were in many respects more restrictive than the old tariffs.

The new tariffs contain intricate, detailed, and arbitrary provisions using an entirely new terminology, the substance of which results in a retention by the telephone companies of virtually all of its former equipment monopoly. The new tariffs require customer-provided equipment to comply with "standards" and to be connected to the system with connecting arrangements and access arrangements under a tariff structure which is patently discriminatory.

Were the new tariffs permitted to stand as written, the telephone subscriber could not economically justify purchasing or leasing terminal equipment from private companies when a much simpler and more economical connection configuration is available from the telephone company.

The tariffs contain repeated examples of Bell's attempt to prejudge the quality of privately manufactured equipment and communications systems. The tariffs assume that all of such equipment is of poor or dangerous quality and proceeds to restrict and proscribe the connection and the use of such equipment.

The new tariffs are, in summary, in flagrant contradiction to both the spirit and the letter of the Carterfone Decision and

(Continued on Page S/14)

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* *THIS OFFER EXPIRES AUGUST 31, 1970*

Specifications

Model	A	B	C	D
Characters/line	32	32	64	64
Number of lines	10	20	10	20
Character size (nominal)	.15" high, .10" wide			
Line spacing	45 character height			
Character spacing	40 character width			
Character format	5 x 7 dot matrix			
Character set	64 character ASCII			
Cursor	Non-destructive Blinking underscore			
Refresh rate	50/60 Hz			
Memory	MOS shift registers			
I/O rate	110-2400 BPS standard, High speed serial or parallel optional			
Communication interface	RS 232C or current loop			
Parallel interface	TTL logic, bit parallel, demand-response control			
Power	125 watts, 110-220 volts, 50/60 Hz			
Size	15" high, 17" wide, 27" long			
Weight	65 pounds			

PRICES	PURCHASE	MONTHLY LEASE*
VISTA 1A	$1,495.00	$ 78.75
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VISTA 1D	$2,495.00	$116.25

*includes maintenance for three year lease plan

Command Functions
- Cursor control — up, down, right, left, home
- Start blink, stop blink
- Erase screen

Interfaces

The standard interfaces allow connection to modems up to 2400 baud. Available as options are serial or parallel data interfaces up to 800 characters/second synchronous, or up to 1500 characters/second in a demand-response mode

Operating Modes

I/O	Full duplex or ½ duplex
Format	Roll or page

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- High speed data transmission up to 1500 character/sec.

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Rise of Multiple Vendors

Communications on System/360 Created Problems

By Peter L. Briggs
CW Supplement Editor

The advent of the System/360 created a broader market for communications systems. More users began to consider their applications from an on-line viewpoint, and introduced several levels of complexity to the task of testing and designing systems.

The System/360 came equipped with communications controllers, in the form of the 2701, 2702, and 2703. These controllers were much more flexible and more accessible than previous equipment for the 1400/7000 equipment had been. But this introduced its own problem – new concepts that must be absorbed.

The software provided by IBM came in two packages, a Basic Telecommunicatona Access Method and a Queued Telecommunications Access Method (Btam and Qtam respectively). Some of this software worked, most of it didn't, when the systems were first delivered in the mid-60s.

The testing problem was further complicated by this incompletely debugged software, putting the user in the position of testing out IBM's software at his own expense. This situation has left many users with a bad taste, and has contributed to the growing search for equipment and software from other vendors.

The addition of new software, and new products, has again complicated the user's problem by introducing new variables during debugging, and by introducing a new factor into the responsibility area – multiple vendors.

Where Does the User Go?

The user has found himself in trouble, simply trying to find out what is not working, and then defining who is at fault and who must fix it. Too often, the user has been unable to determine what, exactly, is wrong.

The outside consultant has entered into the arena, but this too does not solve the problem. The consultant must become familiar with the kind of problems encountered in the past, he must learn what the particular idiosyncrasies for a particular non-IBM vendor might be, and he has to become familiar with the system being installed. This requires time, and usually is not accomplished quick enough to help a user out of a tight spot.

Users have begun to train and recruit specialized in-house system programmers. These programmers demand a very high salary, and usually come under the title of Director of Communications or a similar title. It takes about four or five years to get a programmer skilled enough with, for example, Btam and Qtam, for him to be worth the $15,000-$25,000 salary he can get quite easily. If he does not have the right background, he can create a disaster through ignorance.

The user must still bear the overall responsibility for his own ignorance, and he finds it very difficult to locate adequate data about his own or other installation's problems and solutions.

IBM-Provided Aids

IBM has developed some manuals and some education courses to help users adapt to the terminology and concepts of data communications, but the technological changes happen too rapidly for anyone but a specialist to keep up to date with the new equipment and new tariff possibilitles.

Even IBM's equipment presents problems. What is the most economical configuration for any given number of terminals working at a certain mix of speeds over certain types of lines?

IBM has a manual for its salesmen and systems engineers that helps them configure its equipment, but that excludes everything but IBM-manufactured equipment.

These salesmen and engineers are trained to help IBM sell its own products, and most of the sales people have never really dealt with communications too often. The specialisits are very expensive, under IBM's separate pricing; in fact, more expensive than most good outside consultants.

(Continued on Page S/11)

peripherals as needed. Perform off-line data [illegible], too.

Besides, it costs a lot less to use. That's the name of the game.

DTS-100

Extender!

Bell Services, Equipment Offer Confusing Array

(Continued from Page S/2)

service and local tariff. Bell is reportedly developing a DAA-type device for use on leased lines, and this unit is scheduled to be tariffed in July, 1971.

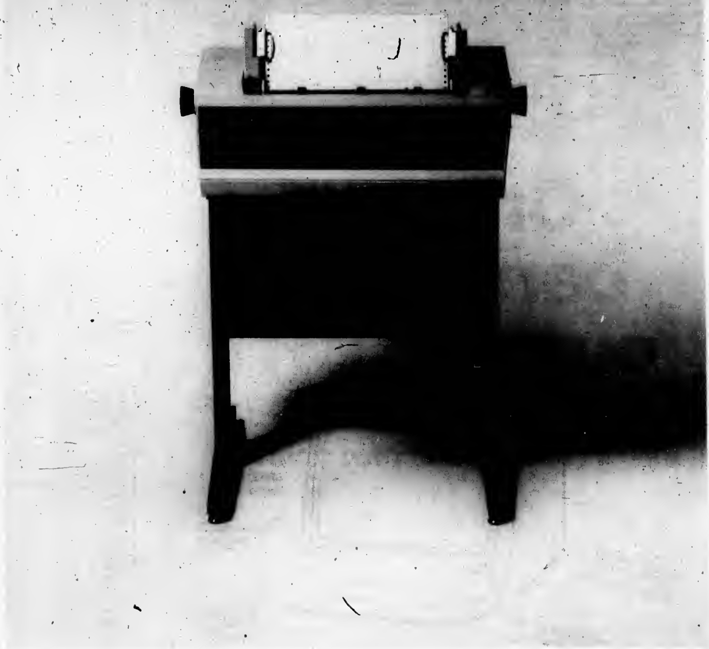
Although various firms have filed proposals with the FCC for data transmission links and/or networks, it is still virtually impossible for a computer user to transmit data from point-to-point without the use of Bell lines and/or equipment. The exceptions are only in areas served by independent telephone companies, but even here the user is subject to a regulated tariff.

It is expected that this situation will change as more non-Bell equipment becomes available and as the FCC approves alternate data transmission facilities for computer users.

These alternate facilities and equipment will undoubtedly provide cost advantages to data users in the future.

However, the computer user of today, in most cases, still must utilize Bell services and equipment for the configuration of the transmission part of his network.

Memorex breaks the speed limit with the 60 CPS Communication Terminal.



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MEMOREX

Radical Change

Mini Front-Ends Provide Alternative to Multiplexer

By Jack M. Pearlman
Special to Computerworld

The day of the non-programmable communications front-end for large computers is nearing an end. The minicomputer can do the job cheaper and better; if offers capabilities only dreamed of previously.

The conventional solution to the problem of connecting a number of communication lines to a computer is to purchase a variety of devices known collectively as multiplexers.

These are hard-wired machines (non-programmed) whose prime function is the transfer of characters between the computer and several associated telephone lines. Multiplexers permit the lines to time-share a single input/output path to the computer and so minimize the drain on central processor resources which would otherwise exist.

They tend to be single-purpose, generally inflexible and rapidly exhaust capacity as the data rate goes up; their maximum data rates are usually low – 7,000 to 20,000 char/sec being a typical range.

In general, the standard multiplexers are viaducts for characters and do very little processing. Nearly the entire data-handling load, error checks, validity checks, and other non-number crunching routines fall on the cental processor.

The IBM 2701 is typical of the hard-wired multiplexer. It can support four asynchronous lines or two synchronous lines. A two-synchronous line configuration costs a little over $38,000. A third line requires going to a second 2701 or alternatively changing over to the more expensive 2703.

The Honeywell solution is the 286-4. With two synchronous lines, the 286-4 costs approximately $39,400. A third line has an incremental cost of $2,700, somewhat lower than the IBM alternative.

Alternative is Mini

We might then ask whether there is a worthwhile alternative to 2701 – like devices which would be more cost effective and would simplify central processor operation. The answer to that question is yes! The alternative is to replace the hard-wired machine with a programmable device – a computer, more specifically a minicomputer.

For the moment let us simply look at a mini configured to replace, function for function, a 2701. The 4K Nova computer can be purchased, including an interface to either a multiplexer or selector channel for $18,500 with two synchronous lines. A third line carries an incremental cost of $2,250, a saving of $20,000 over the conventional hard-wired approach. Use of the mini, however, really represents a radical change in the whole computing process.

Once a computer becomes the front end, it is possible to distribute work loads, to remove from the main central processor the need for core-consuming, time-consuming routines. Routine operations are moved to where they belong – outside the CPU. Once outside the CPU it is less expensive. In a 360/40, core increments run between $1.00 and $1.50/byte with minimum increments of 65K bytes above 65K. In a typical 16-bit minicomputer, core is approximately $.46/byte in 8K-byte increments.

Mini Savings

Mark Computer Systems of Plainview, New York has built a system around the Nova and Supernova computers which connect to an IBM 360 by treating the 360 as if it were a magnetic tape drive.

An installation of the System/70 Extended Computing System, as it is known, is now going in at the UniCard division of the Chase Manhattan Bank. The prime purpose of this particular version of System/70 is to collect data concerning UniCard Transactions, enter sales transactions, verify the accuracy of a merchant's daily sales slips, etc.

Used as Backup

A secondary purpose is to maintain emergency backup files for the 360 on System/70's own disk and tape files. The system removes virtually all of the housekeeping functions from a 360/50 and allows it to concentrate on its principle task – distributing transactions to individual accounts.

The great flexibility and large computing capability of this system provide UniCard with two cost savings. Since the system was sufficiently powerful (and reliable) to offer excellent backup, UniCard did not rent a second system 360, as had been planned.

Furthermore, the amount of routine work removed from the 360/50, which was then assigned to the System/70, was sufficiently large to allow real-time operation of a major application that had previously been done in batch mode and only on a night shift. The results are a higher volume of transactions handled during the working day, improved cash flow, and greatly increased service to customers.

Jack M. Pearlman is a marketing specialist with Data General Corp., the manufacturer of the Nova and the Supernova minicomputers.

Acoustic Coupler Features DAA, EIA Connectors

FAIRFIELD, Conn. – KWS Controls, Inc. has available a Model 750 acoustic coupler.

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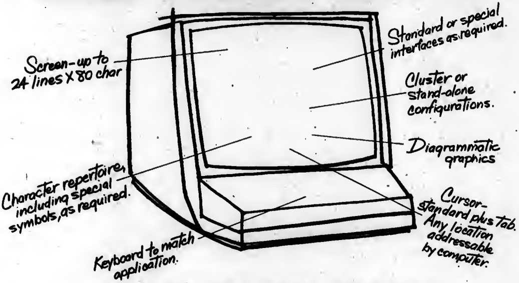
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The System/360 and Problems With Communications

(Continued from Page S/8)

The user must consider several problems when designing or planning a communications system:

- The availability of good advice and experience with the equipment being considered.
- The long-term expansion needs – it is very easy to lock a system into a position that requires redesign for expansion or new equipment.
- The overall balance between the availability of support from IBM and the economic advantages of procuring equipment from independent vendors.
- The probability of new technological changes in the near future that would make it most economical to change systems or equipment.
- The desire to have a system that can be built and debugged easily, conflicting with the need to make the most of whatever equipment is already available.

Languages a Problem

With the System/360, the user must also consider the problems of language usage. In high-level languages like Cobol or PL/1, there are limits to the possible degree of direct interface between the program and the access method. Cobol, particularly, was never designed to cope with the asynchronous processing requirements of communications. The user frequently has to revert to Assembly Language for his communications subroutines. This limits long-term compatibility severely.

For IBM users, it is probably worthwhile to design and build communications systems with PL/1 rather than Cobol. IBM plans to support PL/1 more heavily, and can provide more flexibility and more features within the confines of PL/1 than it can within Cobol. PL/1 will probably work far better on upcoming systems than it has on the System/360, and will undoubtedly be far more efficient. PL/1 is also more suited to nonsynchronous processing; it already has the concepts of such systems built into its design.

The introduction of independently supplied languages that are not themselves written in a compatible language like PL/1, can really bind the user over the next two to three years.

Look for PL/1

Some communications or inquiry/response systems are already being written in PL/1, by software houses. These companies realize that PL/1 is more suitable and are fully aware of IBM's commitment to PL/1. Such outside languages offer a more reasonable approach to solving this particular application problem, because the outside vendor will then have to provide a version of its language for new machines, if it wants to continue in business. This relieves the user of the burden of compatibility with upcoming generations or systems like the IBM NS, expected this summer.

For the specialized system, users tend to resort to Assembly Language because it gives them more direct control over the communications process. This may be economical now, but it will certainly cost a lot when that user wants to change to new hardware. Even though it might be more expensive to run a system written in a high-level language with limited use of IBM's Btam, the long-term savings are certain.

IDS Range Rider Line Expanded

PROVIDENCE, R.I. – International Data Sciences has added a Model 510 pseudo-noise transmission test set to its Range Rider line.

The Model 510, developed to facilitate the testing of simplex synchronous or asynchronous digital data transmission systems for transmit-only stations, can operate in conjunction with Range Rider Models 1000 or 1100 pseudo-noise transmission test sets which have both transmit and receive capability.

The Model 510 test set contains a transmitter that generates a 2,047-bit pseudo-random sequence representing the most noise-like pattern possible.

The purchase price of the Model 510 is $850. The delivery schedule is 30 days.

International Data Sciences is at 100 Nashua St.

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Where Do the Savings Lie?

The Buffered and Unbuffered Terminal Controversy

By John Duffendack

Special to Computerworld

A favorite pastime at any gathering of two or more people in computer-related fields is to trade horror stories about engineers designing special hardware to accommodate poorly conceived software, or programmers writing code to "program around" hardware deficiencies.

Such stories, particularly prevalent in the area of data communications, illustrate the need for a unified approach to systems design.

Com-Share has evolved a communications philosophy that integrates the conflicting requirements of:

- *The communications hardware and software at the central computer site.*
- *The modems and communications channels (telephone lines) that provide service over common-carriers' facilities.*
- *The terminal equipment necessary for proper man-machine interface.*

This article focuses specifically on the current dichotomy within the industry over buffered (large-smart) and unbuffered (small-dumb) terminals.

A Dichotomy Develops

As time-sharing grows in importance, we are witnessing an explosive increase in the variety of terminals available to time-sharing users. In evaluating these terminals, Com-Share has developed guidelines for a terminal philosophy as part of its integrated approach to communications.

One of the concepts investigated is the use of buffered terminals in a conversational time-sharing environment. While there can be little disagreement over the need for faster terminals, or less noisy devices, the rationale for choosing between buffered or unbuffered terminals is less clear.

For those unfamiliar with the terminology, the unbuffered terminal is character-oriented. That is, when a key is struck, the appropriate code is sent immediately to the computer. The information returned by the computer is promptly printed or displayed as it is received at the terminal.

In contrast, a buffered terminal is line- or page-oriented. In this case, as the user types, one or more lines of data are stored in a buffer within the terminal. This block of information is then sent to the computer when the user explicitly presses a transmit key.

Over the past two or three years the terminal industry has experienced extremely rapid development of new and more advanced terminals. Recent development has been directed towards extending the terminal's capability by compensating for deficiencies in the central computer system.

Taking an overall systems approach, the company has compared the capabilities and costs of using the differing types of terminals in terms of software maintenance and computer communications costs and efficiency. As a result, we have reached conclusions contrary to the current trend within the industry.

A Different Conclusion

In comparing the two types of terminal philosophies, we have considered the very specific environment of conversational or interactive time-sharing and characteristics of such processing that motivate the design of a responsive computer-communications system.

In contrast, a remote batch environment has a different set of criteria for man-machine communications, and would lead us to other types of terminals not included in this discussion.

One characteristic of conversational time-sharing systems that must be considered is the numerous short messages that go back and forth between the user and the central processor. The average message length is only 20 to 40 characters.

The interactive nature of the process requires fast response time. The interactive nature of the applications leads to network connection times (holding periods) of several minutes while the user is keying in data and the computer is processing that data.

Another important characteristic of a nationwide conversational time-sharing system like Com-Share's is that terminals accessing the central processing unit are geographically dispersed. This is brought out to stress that the communications protocols used by the airlines and other reservation systems, which take advantage of the geographically clustered terminals, are not applicable here.

Effect on CPU Efficiency

It has been argued that high-speed buffered terminals decrease the load on the central processor by "batching" the lines or pages from the terminal at the request of the CPU. This technique supposedly increases the processor's efficiency. In some computers which are not specifically designed for conversational use, like the B5500 and 1108, this is perhaps true.

However, with properly designed software and hardware, it is of little importance whether the central processor receives characters singly from a terminal, or blocks of characters which have been stored remotely at the terminal and then batched to the CPU.

What is vital is that the total number of characters to and from all the terminals on the system remains a constant over a period of time. Further CPU cost is largely independent of the terminal's transmission speed. Since there seems to be no fundamental difference between the types of terminals in terms of CPU efficiency or cost, we should look at some other factors.

Editing Capabilities

Line-oriented buffered terminals store a single line of data and allow simple editing such as character-deletes before the line is transmitted to the computer.

With a page-oriented device, such as a CRT display with local buffering, a multiline message is entered from the keyboard. Editing capabilities within the terminal then allow the user to delete or insert single characters, whole lines, partial lines, and so forth, before transmittal.

Unbuffered terminals provide these capabilities and more, since the central processor is available to help in the more exotic editing functions such as string searches, substitutions, and data validation. These functions could not reasonably be performed in a general way by a buffered terminal.

Comparative Editing Costs

What are the comparative costs of providing editing features within the terminal or at the computing site? To make this evaluation, one can consider a time-sharing system as costing around $1 million and serving 50 users simultaneously.

Several Installations fall into this class. Using the Com-Share system as an example, the company has found that less than 1% of the central processor's time is needed to perform all the editing and communications functions necessary to support the system's users.

This 1% would represent a cost of around $10,000. A 50-user system actually supports around 250 independent terminals, each of which may access the system at various times during the day. Spreading the $10,000 cost over the 250 terminals yields an equivalent system cost of $40 per terminal for the conversational editing features.

This figure does not include the cost of software or the operating cost of the computer system, but it may be fairly compared with the hardware cost of performing the same editing functions within a buffered terminal by excluding the cost of engineering, maintaining, and operating that terminal.

Comparatively, the purchase price of buffered terminals ranges from $5,000 to $10,000, while the unbuffered versions run between $600 and $3,500. The cost of adding buffering to achieve editing capabilities far exceeds the cost of centralizing this function within the CPU.

Maintenance is also a consideration in comparing the relative costs of buffered and unbuffered terminals. A less-complex, character-oriented terminal with no buffering or editing capabilities would certainly be less expensive to operate and maintain than a more complicated device. This is especially critical if we consider the geographic dispersion of these terminals.

Communication Costs

Next, look at the relative communications costs of buffered and unbuffered terminals.

It has been argued that telephone costs may be decreased by the use of buffered terminals. As the story goes, the user is to prepare a page of information using his local editing capability, then call the computer and transmit the page at high speed. This would be true if that were all the user wanted to do.

However, most time-sharing users want to carry on a two-way conversation with the computer.

In an unbuffered, character-oriented system, the length of time the user is connected to the system is the sum of his keying time, thinking time, computer response time, and computer output time.

In a buffered system, since the input is keyed first into the buffer and then transmitted, the keying and transmission times are not overlaid. Obviously, this method involves an additional cost for the extra time used to transmit the page or line.

Human Factors

One of the overriding considerations in the selection of terminals is the need for the terminal-computer-communications system to be simple to use.

Extra keys not usually found on a typewriter which require explicit use to perform communications functions should be forbidden. In a correctly designed system, all communications functions should be transparent to the user and be carried out without his knowledge. That is, the user should be able to type whenever he wants without the possibility of "garbageing up" a message suddenly sent by the computer, or worrying about the keyboard locking, or having to explicitly turn the line around.

An example of this basic principle is the Viatron Display Terminal, which I will use here as an example of the class of page- and line-oriented terminals.

With this terminal the transmit key must be struck when a message is to be transmitted to the computer. This is especially confusing to the "naive" user (which describes most of us) who sees the information on the screen which has been typed, some of which has been sent to the computer, some received from the computer, and some yet to be sent to the computer.

The user is not always sure what portion of the page has not yet been sent.

The situation is further worsened when one considers use of the Viatron terminal's line-by-line mode. At the end of each line a carriage return and a transmit key must be struck. The average length of a user's message is only a few characters. In fact, on the Com-Share system the average message length is less than five characters.

The requirement for typing an additional key to transmit the line would increase the number of characters by about 20%, decrease the user's efficiency, and increase his "log-on" time by a similar amount. This would be intolerable.

In final analysis, there seem to be no fundamental savings to be made by using buffered terminals in a conversational time-sharing system. In fact, unbuffered terminals seem to have several cost advantages as well as more flexible editing capabilities.

From a communications standpoint, no efficiencies or savings can be gained from buffered-terminal techniques.

John Duffendack is national manager of communications for Com-Share.

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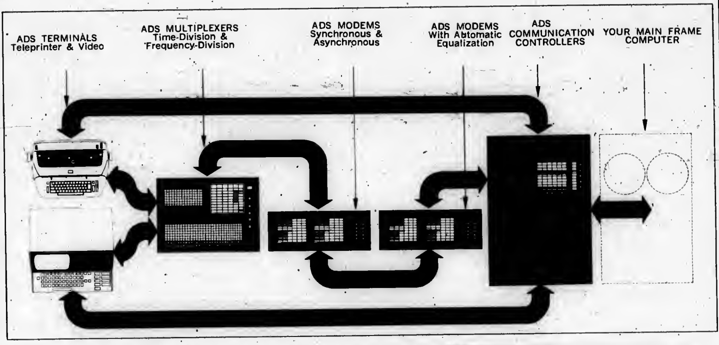

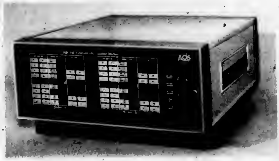

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FCC Discards 'Case-by-Case' Method After Carterfone

(Continued from Page S/7)

many observers have frankly questioned the good faith of AT&T in filing such tariffs.

Unlike the events which followed Hushaphone, many members of the communications industry promptly filed pleadings with the FCC strongly objecting to Bell's attempt to circumvent the commission's decision.

At this writing almost 50 parties have intervened in the Carterfone proceedings with strenuous objections to virtually every section of the tariff structures for the switched network, private lines, and Wats (Wide-Area Telephone Service).

The intervening parties include some of the nation's largest corporations, large communications trade associations, departments of the government, and other representatives of the industry.

Series of Conferences

As a result of these strenuous objections to the tariffs filed by Carterfone and the various intervenors, the commission ordered that the Common Carrier Bureau of the FCC conduct a series of informal conferences of members of the industry and other interested parties to determine the many questions which had been raised.

Unfortunately, that procedure has now dragged on for some 17 months and only now are some slight signs of progress being evidenced. In particular, the engineering study by the National Academy of Sciences will, some time this month, be submitted to the commission and will undoubtedly have an effect upon the subsequent course of the proceedings.

Nevertheless, the events which have occurred since the Carterfone Decision have revealed the substantial impact of the decision upon the whole industry.

Private Equipment

By opening up the telephone network to customer-owned equipment, the decision has spawned a new branch of the communications industry – that of manufacturing private communications equipment for use with the telephone network. Many new companies and a few of the more established concerns have commenced the design and manufacture of a variety of terminal equipment and voice and data connecting equipment for sale and lease to customers of the various network services.

As a result of the commission's decision, AT&T settled Carterfone's antitrust suit and Carterfone Communications Corp. has, with the settlement proceeds and additional private investment, become a leader in this new branch of the communications industry.

New Principle

In addition to opening the network to new equipment and technological advances, the Carterfone Decision also established a new principle which will almost certainly guide the commission in future cases. The so-called "case-by-case" method of adjudicating or resolving individual disputes one-at-a-time has been discarded by the commission.

Commenting on both of these major aspects of the Carterfone Decision in his speech to the North Carolina Independent Telephone Association in April, Bernard Strassburg, chief of the Common Carrier Bureau of the commission, stated:

"The FCC decision issued in June, 1968, in the landmark Carterfone case, resulted in scrapping the conventional prohibitions against interconnection contained in interstate message toll tariffs.

"The FCC condemned these long-standing practices as unlawful because they prohibited the attachment of any and all customer equipment and systems without regard to whether such attachments were harmful to the telephone network.

"The commission concluded that those practices imposed unreasonable restraints upon the freedom of the subscriber to use his service in a manner which would be beneficial to his business or social need or convenience without being detrimental publicly or systematically.

"The commission also scrapped

(Continued on Page S/16)

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Carterfone Promotes New Communications Research

(Continued from Page S/14)

the case-by-case approach to determining when a specific item of equipment might be deemed safe and permissible and thereby warrant authorization in the tariff. In too many instances, the case-by-case approach either required lengthy and costly administrative proceedings or simply discouraged a potential user or supplier of new equipment from making the effort to have the tariff restriction modified."

Question Acknowledged

Further, Strassburg pointed out that the commission has acknowledged the validity of the question "as to whether and under what conditions the responsibility for network signaling might safely be relinquished to or shared with the subscriber."

The whole issue of network control signaling is now before the commission and the ultimate decision on that aspect of the proceedings may well broaden the impact of Carterfone.

The Consequences

Certainly, the practical and technological consequences of the principles announced in Carterfone are enormous and far reaching in two respects.

First, equipment and communication techniques which have been in existence for several or many years but have been prohibited by the telephone companies can now be marketed or at least re-evaluated for marketing purposes.

Secondly, and more important for the future, the very existence of the principles established by Carterfone encourages research and creative approaches with a view to new communications technologies and products.

One major example of that process is the frequent application of the Carterfone principles to data communications even though the Carterfone device itself was restricted to voice transmissions.

An increased usage of the telephone system is an additional consequence of the decision and that, in turn, dictates that efficient and flexible terminal and communications systems be made available to the public.

Such equipment and systems will be able to perform a variety of functions: acoustically, inductively, and directly coupling the customer equipment on his premises to the telephone system; enabling the customer equipment to signal into the telephone system; enabling the customer equipment to receive ring signals directly from the telephone system in an unattended mode; monitoring high-speed data transmissions from customer equipment through the telephone system to other customer equipment at distant locations; channel switching equipment which permits information coming off of the telephone system to be relayed to the customer's locations at other distant points by means of private lines, microwave, radio, etc.

Broader Attacks

The new technology in communications systems will, in turn, require broader attacks on a number of tariff policies and practices long cherished by the telephone companies.

Continual pressure by all members of the communications industry to effect substantial changes in the telephone company tariffs is essential if the original purpose of Congress, as stated in the Communications Act, is to be fulfilled: That of making available "to all the people of the U.S. a rapid, efficient, nationwide, and worldwide wire and radio communications service with adequate facilities at reasonable charges. . ."

That policy, reflected in an advanced, efficient, and economical communications system, cannot be constructed on a foundation of telephone company tariffs which embody a protectionist and monopolistic public utility philosophy of an earlier era.

Fortunately, it appears that the Carterfone Decision represents a major defeat for those unlawful and regressive policies of the carriers. It is now the challenge and the opportunity for all the members of the communications industry, large and small, to continue this momentum by taking the initiative at every opportunity to challenge those restrictive and undesirable policies. This writer is confident that the communications industry will be equal to the task.

Ray Besing is a partner in the law firm of Geary, Brice, Barron, & Stahl. He represented the Carter Electronics Co. in a suit against AT&T that led to the now famous Carterfone Decision. Besing is a specialist in tariff regulations and their impact on communications users.

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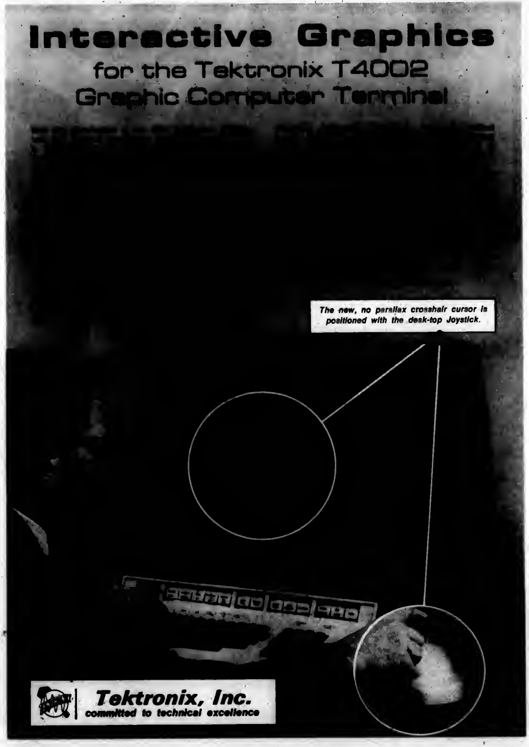
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Total Systems Approach Needed in Network Design

By Dr. Dixon R. Doll
Special to Computerworld

Over the past several years rapid change has characterized the FCC's regulatory position governing who can use the common carrier communication lines, and how they can be used.

The result has been an exposition in the use of telephone lines for both voice and data communications. The communications manager who is concerned about cost effectiveness will now look to new tools and techniques to reduce capital outlays for communications.

Equipment manufacturers have been engaged in the development of new hardware to expand the capability of available lines. Channels have been "compressed" with a resulting improvement in the common-carrier equipment's capacity to transmit voice and data.

Another factor has now become paramount in the eyes of the communications manager. This consideration – the optimum configuration of his voice/data communication lines and terminal equipment – has been made both more likely and more difficult technological changes. It is now possible to obtain more cost-effective networks but it is also more difficult to determine the optimum configuration.

The high costs of lines and increased equipment capabilities, however, make total network charges highly sensitive to changes in line routings and the types of terminal equipment used. Determination of the optimum network is a significant budgetary factor.

Today's Possibilities Large

Today, the large network user and the individual designated with the design responsibility for such networks have access to computational capabilities that were impossible a few years ago. Due to such advances and to the extremely large capital outlays required for corporate communications, network users are becoming increasingly aware of the importance of having efficient, reliable networks.

However, due to the changing nature of the communications art and the complexity of the systems involved, obtaining optimum network configurations still constitutes a difficult technical problem.

Most of this complexity accrues from the rapidly changing regulatory situation. Consequently, many new variables have recently become important. The basic upshot of all these factors is that yesterday's optimally designed communication network can frequently be made even more cost effective and reliable for today's operating environment if the user reconfigures the lines and terminal equipment.

Numerous tools and techniques of varying quality and scope have been developed to aid the systems engineer charged with spending his company's communication dollar in the most productive way. However, none have as yet successfully incorporated all of the key tradeoffs which must be considered in obtaining the least costly network organization which satisfies a particular application.

Some of the currently available network modeling techniques are simulation oriented, others analytical in nature. Simulation programs, many of which are company proprietary, have become increasingly popular lately and can be used very effectively to model communication networks in almost any desired level of detail. This advantage is offset by several limitations, notably the limited usefulness of simulation in a design environment and the difficulty of comparing independently conducted studies.

Consequently, it appears that the most promising approaches to filling this void must be analytic in nature. Since there are so many possible combinations of independent design variables to be considered, a fundamental requirement for a practical communication network design program is that it be capable of considering a relatively large number of different configurations.

Programs developed by several of the common carriers and computer manufacturers are equipped with this facility. However, it is generally acknowledged that none of these design programs are equipped to work with all of the key variables which must be considered in designing efficient and reliable communication networks.

The Design Criteria

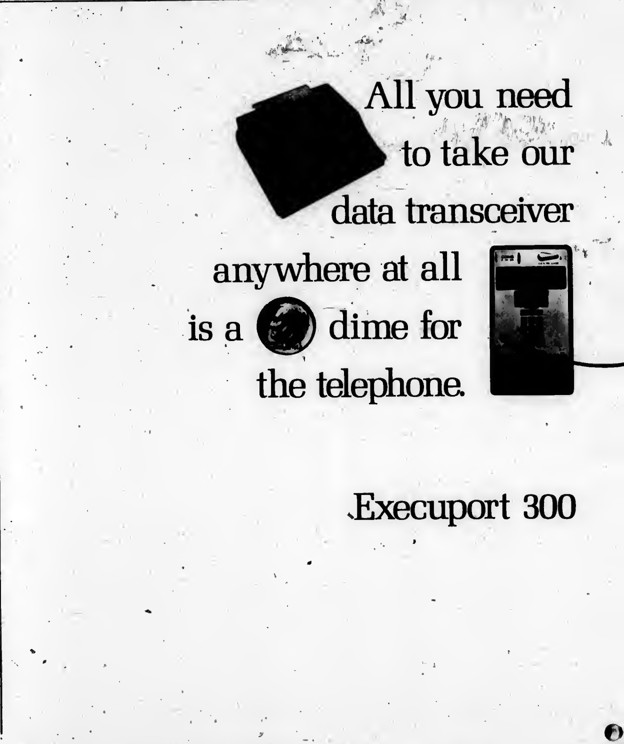
All of the important major design variables – network structure (line routings), method of concentration, type of terminal equipment, transmission rate, performance, cost, control procedures, and reliability – must be considered at some meaningful level of detail.

Only by placing emphasis on the systemwide approach to optimum network configuration can the best network be designed. The designer should be able to make full use of whatever data communications modules or building blocks are of interest.

The design options should be selected from a range of hardware components offered by different vendors, including modems, remote I/O terminals, concentrators, and error control systems, in addition to the common-carrier lines. Cost data on these modules and the common-carrier line tariffs should form the basis for the systematic assessment of the many tradeoffs, which must be considered. Only by using this type of modular approach to communication network design can the best systemwide configuration be determined from an objective standpoint.

The techniques of designing communication networks from a total systems standpoint have been and will continue to be refined. Currently, several firms provide large-scale users of voice and data networks with a comprehensive network design capability which includes all of the important design variables, among them, Datamax. In addition to those tradeoffs usually considered, Datamax is fully prepared to weigh the relative advantages of time and frequency multiplexing, and store and for-

(Continued on Page S/19)



Best Suited for Planning Stages

Role of Communications Consultant Often Mistaken

By Robert T. Coppoletta
Special to Computerworld

The explosive growth rate of computer-oriented communications is creating a need for trained communications specialists. The Bell system says that there were 131,000 data sets in operation in 1969, up 56% from 1968.

There are few such specialists available, and the smaller user simply cannot afford to support a staff of communications engineers. Very few of the communications consultants available also know the computer industry requirements. In the past, computer manufacturers would generally refer clients to the local telephone company. This offered the user no real equipment choices, nor did it improve his understanding of the services available.

Recent tariff revisions permit the interconnection of many different manufacturers' equipment to the switched Bell network. This change has introduced new variables and a whole group of new products that must be evaluated.

Particularly in this broad-spectrum equipment evaluation, the consultant can help users. However, such a consultant must be chosen with proper regard for his experience and general qualifications.

- Is he familiar with the type of system you contemplate?
- Is he familiar with current tariffs?
- Has he studied and used the independently available terminals?
- Does he rely heavily on the telephone company for line performance data?
- Does he have experience to back up his numbers and performance criteria?
- Is he generally familiar with computer equipment for on-line applications?

Don't Call a Salvage Expert

Too often, the communications expert is called in to salvage an already disasterous situation. His proper role is in the earliest stages of planning, not when things have been finalized.

The customer must also work within the limits and the advantages of a consultant. The consultant can only give advice based on his knowledge of a user's situation. He can't be expected to comment about, or include, information that is not made available to him freely. No consultant should ever be hired to confirm or justify the opinions of existing employees; he should be hired to contribute his knowledge in the planning and implementation of systems in many companies.

Companies tend to expect on-line systems to be a panacea for their data problems. Management may push the consultant towards the use of sophisticated or ''prestige'' equipment or systems when they are not appropriate for the proposed system needs. Management, in its agressive drive to use the latest technology, sometimes feels that everything ought to be computerized, however costly it might be.

Sometimes, the consultant over-designs a system. This can be the result of hiring a consultant who represents a particular manufacturer or who is told to recommend a particular manufacturer's equipment. Fortunately, this is quite rare.

Many vendors of communications equipment are called on to help a user design his system. Many vendors have responded by hiring specialists in communications system design. These experts are usually less expensive than an independent consultant but are oriented to a particular manufacturer. The best time to select such consulting help from the vendor is after the user, with or without an independent consultant's help, has already selected his basic equipment and basic design.

Data communications has many aspects, and each of these aspects, and the new ones that will develop, make the selection and design of communications systems more complex. Even the smallest communications system requires careful consideration as to need, required capabilities, and available talent before any commitments are made.

Robert Coppoletta is the marketing manager for Data Access Systems, Inc., a supplier of terminals and communications equipment.

Total Systems Approach Needed In Network Design

(Continued from Page S/18)

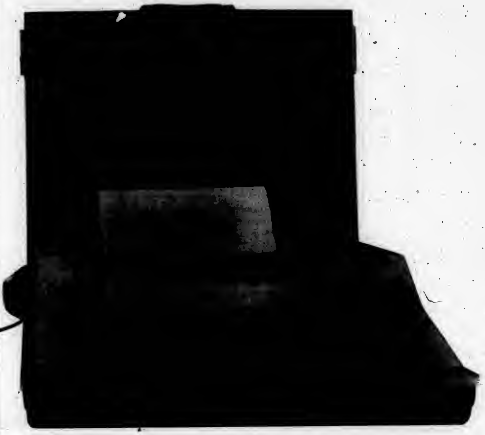
ward buffering of entire messages at remote points in a network.

Polling Rates

Another capability is the complete specification of the optimal subchannel bandwidths or polling rates for each multiplexed link in every network configuration considered. Economies of scale in the cost of transmission capacity available from the common carriers are exploited to balance line transmission speeds with actual traffic. Either random and/or steady-flow throughput constraints can be specified for each remote terminal in the network.

Such firms recognize that due to the diversity of applications in the communications industry, each user has special design objectives that must be considered.

Dr. Doll is the manager of systems engineering for Datamax, a modem manufacturer.



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CICS allows BAL modules only.

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CICS provides no similar utility capability.

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Has Ma Bell Adjusted To Data Communications?

By Theodore A. Dolotta

Special to Computerworld

"That's simple – we'll take care of it!" said our man at A.T.&T. Well, with all due respect to that largest of our common carriers, it ain't as simple as all that!

A data communications system (just like any other communications system) can be evaluated in terms of: availability, reliability, suitability, flexibility, and, last but not least, cost.

How do the data communications services provided to computer users by Bell stack up in terms of these criteria? Answer: A bit better than provided by most state-owned European telephone companies, but it's getting worse fast (note that in Great Britain, the telephone service is getting "unbundled" from Her Majesty's Government in the very near future!).

Try and Get Equipment!

Availability: Bad. Try ordering a telephone line in Manhattan (if you are a masochist, ask for Touch-Tone), an FX or In-Wats line from anywhere to anywhere, or a Model 37 Teletype (those of you who believe those "Data Arrives by Jet at 1200 wmp," "Fully Datamated Teleterminals!," "Sorry, No Hieroglyphics, but . . . ," and "Phi Data Kappa Set" ads in various trade journals – sorry, but the Model 37 seems to be alive and well in only two places – the Teletype Corp. in Skokie, and the Westrex Company, Ltd., 152 Coles Green Road, London NW2, but certainly not in most of Ma Bell's operating companies). Too bad!

Reliability: The first six months to a year are for debugging (but you get billed for long distance test calls placed by the repairman – who, in all fairness, is usually friendly and really tries to be helpful, but there is only so much he can do).

Question: Are 10 individual FX lines more reliable than a single FX line with a multiplexer at either end? Answer: No, just more expensive. Even though someone naive might think it unlikely that all 10 lines would go on the blink at the same time, it so happens that usually they'll all be routed over the same "T1 carrier link," and when it goes out, so do all your FX lines. Too bad!

Suitability: For about a week, New Jersey Bell Telephone Co. offered for rent a neat new gadget for only $9/mo: the 113A data set – an originate-only data set – no power cord, one small box – neat! But then, something happened – and it's available no more. So we're back to the bulky, two-box, 110 volt-powered 103A at $25/mo. Too bad!

Flexibility: Here we made out a wee bit: after a long and silly

(Continued on Page S/22)

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'Hybrid' Services Affected

Will FCC Interpret 'Primary Business Test' Loosely?

By Stuart L. Mathison
Special to Computerworld

On April 3 the Federal Communications Commission issued a tentative notice of rule-making dealing with several policy issues in its long-standing computer-communication inquiry. One of these issues involved the regulatory status of "hybrid" computer-communication services. A "hybrid" service is defined by the FCC as a remote-access computer service which combines data processing with store-and-forward message switching.

Data processing and information services have historically been unregulated activities. However, under today's law, the practice of storing and forwarding messages for others constitutes common carrier communications, and is regulated by the FCC.

The specific question is: Under what circumstances should a message-switching capability, when offered with data processing services, be treated as a sale of communication for hire and therefore be subject to regulation?

A controversy which arose in 1965 illustrates the nature of the problem. The Bunker-Ramo Corp. offers a remote-access, computer-based stock quotation service to the brokerage community. Current stock information from the various security exchanges is stored in the Bunker-Ramo computer and transmitted to visual display terminals in the brokers' offices via communication lines leased from the common carriers.

This information retrieval activity is unregulated.

In 1965, Bunker-Ramo attempted to expand this service and offer to subscribers the capability to send administrative messages among their offices and "buy and sell" orders to their representatives on the floor of the exchanges.

Both AT&T and Western Union refused to lease the necessary communication lines to Bunker-Ramo to be used in this manner, because, the carriers claimed, Bunker-Ramo (a non-common carrier) would in effect be performing communications common carriage. Thus the new service was foreclosed.

Since 1965 the regulatory status of commercial hybrid services has been unclear, although AT&T's and Western Union's refusal to provide communication lines to companies offering hybrid services has effectively prevented them from coming into existence.

In its proposed rule-making, the FCC has taken the position that "where message-switching is offered as an integral part of and as an incidental feature of a package offering what is primarily data processing, there will be total regulatory forbearance with respect to the entire service. . ."

The commission further said: "If. . . the package offering is oriented essentially to satisfy the communications or message-switching requirements of the subscriber, and the data processing feature or function is an integral part of and incidental to message switching, the entire service will be treated as a communication service for hire. . . and will be subject to regulation."

The commission proposed specific criteria for determining whether a message-switching capability grafted onto a remote-access computer service was permissable. If the message-switching capability had the characteristics of similar services offered by conventional common carriers and was, therefore, a substitute for these services, it would not be allowed. Second, if the message-switching feature of the hybrid service did not facilitate or relate to the data processing capability, but was essentially independent of such data processing, it would not be allowed.

'Primary Business Test'

Although it is generally agreed that the commission's proposed use of this "Primary business test" (initially suggested by IBM in an open letter to the FCC) is a significant step forward, implementation of the test will involve a number of difficulties.

A case-by-case examination of each commercial hybrid service will be required (until a body of "common law" in the form of administrative and court decisions is built up). Unfortunately, the case-by-case approach is likely to discourage the formation of new hybrid services, since administrative hearings involve costly time delays and legal fees, and increase the risk that the service offering many not be allowed.

As is the case with most activities before an administrative agency, the small businesses which are usually the most innovative will be the least able to justify the time and expense associated with the FCC's administrative proceedings. Also, the flexibility of companies offering hybrid services will be significantly limited, since any material change in the "mix" of an "approved" service offering might require a redetermination of the regulatory status of the service.

Hopefully, the commission will interpret its "primary business test" loosely and thereby allow hybrid services to develop. Most probably, industry-oriented hybrid systems would be introduced which offer both message transmission and processing services.

Stuart L. Mathison has served as a consultant to various government agencies including the FCC and the Department of Justice. He is a recognized authority on communications tariff questions, and is a member of the information systems group with Arthur D. Little, Inc.

Portable Terminals to Have Great Impact On Business Operations of Companies

By Ray Borrill
Special to Computerworld

Portable terminals greatly open up the powers of the computer for large-scale use outside the corporate computer center. Inevitably they will have a marked impact on the way companies do business.

Stationary terminals have already provided access to a computer for many people never previously associated with its use – retail clerks, bank tellers, reservation personnel, and many more.

The introduction of truly portable terminals in the marketplace over the past year will add the impetus to bring the computer to other corporate personnel outside the computer center. The new page printers, the voice response terminals, and the latest – the CRT terminals – are all intended for wide-scale use among employees who today do not utilize the computer for their work.

Portable terminals will implement many corporate goals, not the least of which will be the development of management information systems which for many have not gone beyond the talking stage.

Marketing, Production

The main impact of portable terminals will be on the marketing and production departments of companies. In some companies, arming an entire sales force with portable terminals may well mean that a company for the first time can operate at its efficient best.

Salesmen will know the status of inventory; they will know what they can sell; they will be able to check immediately the client's credit and actually place the order – all because the salesman has a portable terminal which enables him to telephone to the company computer and gain this information. When this happens, new marketing strategies will have to be developed.

Managers of data processing centers must play an important role in helping their companies recognize the potentialities of this new way of doing business. They must be able to look outside their computer centers and take a look at their company, and perhaps discover the real nature of its business.

They must ask themselves: "What kind of a product is my company selling? To what kind of a market are we selling? How are we selling the product? How do we produce the product? How do we assemble it? How do we keep an inventory? How do we perform quality control tests of our product in production?"

It is only after these questions have been answered that data processing managers can help their companies discover the possibilities of portable terminal systems. But first the data processing manager must explore for applications of these portable terminals for his company.

Of course, portable terminals could also be employed within the corporate computer center. Programmers in corporate computer centers will also want to use portable terminals for program development.

For this is the way programmers like to work. They can work with a program at their own speed without waiting for the turnaround cycle of a batch system.

Perhaps, too, data processing managers might consider keeping a pool of portable terminals around for those who have short-term needs.

Ray Borrill is the manager of corporate planning for Applied Digital Data Systems, Inc.

Has Ma Bell Emotionally Adjusted To the Idea of Data Services?

(Continued from Page S/21)

battle, we now have jack-terminated data sets, so we can plug them wherever there is a standard 4-prong telephone jack. And of course the Carterfone Decision helped.

Cost: Question: What can you say to a monoply? Answer: "FCC" and "(Your State) Public Utilities Commission!" Question: What good does it do? Answer: Makes them blanch on cue, and makes you feel superior. The prices keep going up, though. And then there was that ad in the July, 1969, Fortune: "I take it all back (What I said about long distance costing too much)."

Emotionally Adjusted?

By and large, one gets the feeling that Bell just hasn't become emotionally adjusted to the idea of data communications. It keeps making pious noises in that direction – we have all heard that "by 1975, half of AT&T facilities will be used for data transmission!"

Brave new world!

But . . . AT&T grows at 8% per year (New York Times, April 13, 1969). About 5% of that is because of, if you'll pardon the expression, the "population explosion." The other 3% is not enough to take care of the fact that we all seem to talk more on the telephone these days: It's easier with Direct Distance Dialing – and after all, we keep getting admonished to "Call Long Distance – the next best thing to being there," and we're told that "to communicate is the beginning of understanding."

So when the usage of voice facilities goes up by 6% per year, as it did around Wall Street between 1967 and 1969 (New York Times, July 28, 1969), the whole system collapses.

So just where is that 50% for data communications going to come from by 1975, since Bell can't even keep up with the normal growth of requirements for voice communication?

There seems to be trouble ahead. And that goes, in all fairness, for GT&E, etc.

One last word of advice – have them explain all their bills to you – item by item: it'll pay off.

Theordore Dolotta is the president of Princeton Time-Sharing Services, Inc., a supplier of conversational and remote-batch time-sharing.

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Overview of Development Trends

Terminals Have Increased Capabilities, Applications

By Frank Piasta
CW Staff Writer

The concept of terminals is not new. They have been used for so long a time that millions of Americans expect to hear or see a news broadcast upon hearing the distinctive clatter of a teletypewriter.

When the computer industry entered communications, it too relied on these proven devices. Although they had been fast enough for wire service work, they proved rather slow by computer standards. The noise, somehow, became more objectionable, when the romance connected with a fast-breaking story a continent away was replaced by a more prosaic string of accounting data.

Errors could be more easily detected and forgiven in the draft of a news story that would go through an editing process, than it could be with page after page of numbers.

Teletypewriters, however, are relatively inexpensive, easily obtained, conveniently serviced, and can be readily made compatible with computer coding standards. So, in spite of their shortcomings, they became the most popular terminal, with most modem manufacturers priding themselves on their capability.

Competitive Devices

The makers of computer peripheral equipment have never been known as a slow-moving group, and so it was inevitable that competitive devices would be introduced. In general and in detail, every complaint against the older units has been overcome by one or more of the replacement devices now available. Speeds up to six times as fast are coupled with quieter operation. Some machines using non-impact printing are so quiet they are almost silent.

More reliable printing mechanisms, and more sophisticated error-checking procedures have been combined to increase the reliability of the computer data.

In the quest for quieter, faster terminal operation, alternate methods of data representation have been investigated. A result of this is the terminal based on a CRT, similar to the familiar television picture tube. Fast enough to work at the speeds allowed by commonly used data transmission lines, these devices are also inherently silent.

The lack of a printing mechanism has allowed the size and weight of this type of device to be reduced in models that are truly portable. Editing of data before transmission is eased by allowing the operator to visually scan a full page of data and make any necessary corrections.

Data compression is achieved by eliminating the need to transmit blank lines. The ability to differentiate between fixed and variable data, with only the latter to be filled in by the operator and to be transmitted has contributed to reducing both errors and transmission times.

The lack of hard copy generated at time of transmission and reception has been a drawback in the use of CRTs.

The non-permanence of the displayed data makes it necessary for the image to be refreshed constantly. This requires more elaborate circuitry incorporating a memory with at least page capacity. The refreshing process also results in the flickering of the displayed image, which might result in accelerated operator fatigue.

Techniques to eliminate these drawbacks have been used in the design of some CRT-based terminals. One of these recently announced devices uses the CRT to record data on a substance that will retain the image until it is erased either by the operator or by the controlling program.

Hard copies are obtained by diverting output image onto a xerographic copier. Alternate methods of obtaining hard copies are being developed, ranging from making photographic copies of the tube face to using the input data to the CRT to drive a printer.

Terminal Capabilities

With the increased attention to remote operations it was almost inevitable that the idea of enhancing the terminal capabilities should appear. The advantages inherent in reducing the workload on the central computer by not only preprocessing data for submission to the main system, but also eliminating some of the less complex operations have stimulated the development of the so-called intelligent terminal.

Varying from accounting machines to full-scale computers, intelligent terminals are capable of performing a wide range of procedures, from those as simple as data formatting to those as complex as data analysis.

A major timesaver for the central computer is the intelligent terminal that can be used to produce hard-copy reports at the remote site from input data received through the communications lines.

Apart from their communications equipment, most intelligent terminals are configured much as if they were stand-along systems, with the usual complement of card, paper and magnetic tape, and printing equipment, allowing for both on and off-line functions.

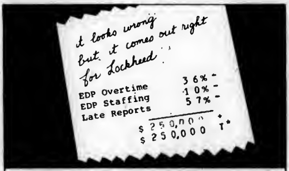
Special-purpose terminals have been devised for use under many different conditions for a wide range of applications. Portable terminals equipped with keyboard input and audio output can be used with an acoustic coupler by salesmen. A similar unit, with a tape recorder added, is used for such applications as utility meter reading and poll taking and other applications where it is practical to collect a quantity of data and then transmit it at a higher rate over telephone lines.

Some units of the keyboard type have been designed for use within certain industries. Equipped with proper labels, a unit could be used as an inquiry device by a real estate salesman who would press one key for each parameter of his request for information.

Non-portable terminals have also been developed for industry use. One of the pioneering efforts was by the airlines whose seat reservation systems use non-standard terminals. A newer development has been that of ticket-vending machines that dispense reserved seats for theatrical and sporting events.

Department stores are using special terminals, too. Credit checking using a central data base is performed by large chains through a terminal at the point of sale. Electronic cash registers that combine credit verification with sales recording and normal cash register functions have been installed.

This is just a sampling of the applications of special purpose terminals. The prospect of a household terminal in each dwelling unit seems not as remote or impractical as it was in the past.



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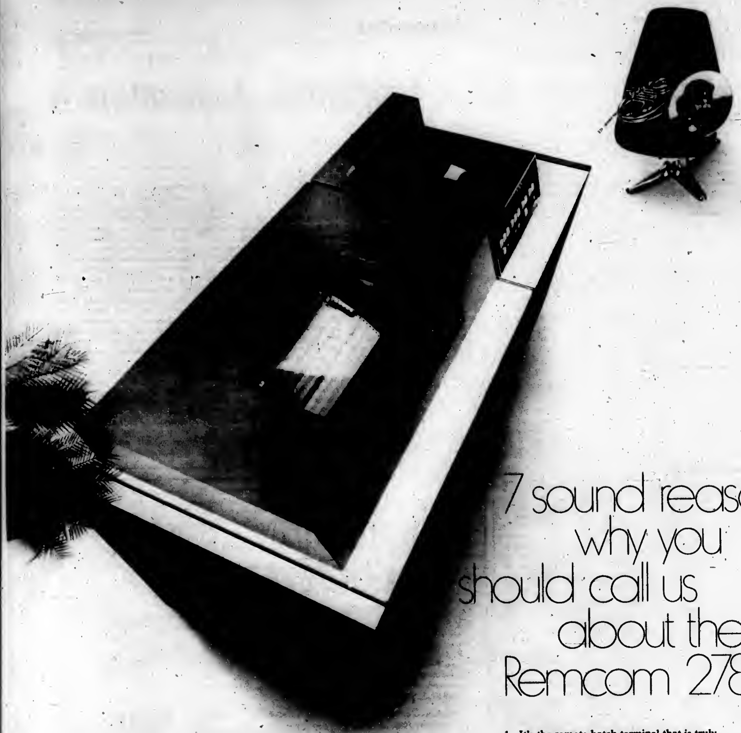

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Two-Year DP Programs Emphasize Practical Training

In this second of two articles by Dr. John Maniotes, chairman of the computer technology department at Purdue University, he describes the training, value, and emphasis of the two-year DP program as well as the deficiencies of private commercial schools.

Two-year DP programs have moved into the vacuum created by the exodus of the four-year CS programs by assuming the responsibility of those elements of knowledge which no longer serve a function in the more theoretical CS curricula.

Graduates from such two-year DP programs:

- Are trained to utilize the programming languages of Cobol, RPG, Fortran, and PL/1 as well as a machine and Assembly Language of a third generation computer.

cessing management, system design, and commercial or technical applications.

- Take at least an applied course in computer mathematics and numerical analysis.
- Take computer applications courses dealing with statistics, linear programming, critical path methods, inventory control, and simulation.
- Are trained using the "hands on" approach to operate computers and other peripheral devices and to debug their programs.
- Are introduced to courses in the humanities and liberal arts fields so as to make them aware that there are other things in this society besides computers.

To some individuals, the six items above may appear to overlap certain areas presumably covered by CS programs. This may be so, but the important point to keep in mind is that the two-year DP programs emphasize the practical rather than the theoretical aspects of EDP. In addition, they emphasize the solution of EDP problems using the "hands on" approach which is currently lacking from the CS programs.

Presently, the total number of two-year DP graduates is less than the total number of four-year CS graduates, but the gap is closing rapidly. Those individuals who have complained about university graduates not being able to program are really referring to recent CS graduates and not to the two-year DP graduates. Complaints regarding the two-year DP graduates have been minimal. The only valid complaint has been that there are not enough good two-year DP graduates to go around.

Viewpoint

The job placement of DP graduates has been very gratifying. It is not uncommon to see competent two-year DP graduates command a salary of $600 to $900 per month. Many DP managers are now interested in these graduates since they are far more productive, require less on-the-job training than some of the four-year CS graduates, and seem to be imbued with more job loyalty than their CS counterparts.

Regarding the private commercial schools, it is too early to predict what impact they will have in providing competent training for those students who aspire to enter the programming profession. Some of these schools still produce operators and coders instead of programmers. A few are out for the quick dollar, and others are rocked by scandal or financial collapse, as recently exhibited in Massachusetts.

These commercial schools may produce students who are familiar with BAL, RPG, and Cobol, but what good do all these course topics do when many of these schools fall to expose the students to the fundamentals of communication?

This does not necessarily mean data communication with regard to computers; but the practical kind that involves people, i.e., English, speed, and technical report writing. Without a basic understanding of these topics, how can a student communicate with his supervisor or fellow co-workers unless he resorts to sign language or vocal grunts?

There is no question that the demand for competent computer programmers is growing and the supply has a long way to catch up. In the future, they may not be referred to as programmers, but they still will be the individuals who, after a problem has been defined and an analysis has been made, will write, verify, evaluate, modify, and document the necessary computer programs required to achieve the solution.

This is really the basic function of a good computer programmer.

DP Students to Split Bond of $10,000 From Closed School

BUFFALO, N.Y. – The $10,000 bond, posted by a local computer programming school before it folded last year, has been turned over to the office of New York Attorney General Louis J. Lefkowitz for partial refunds to students.

Students at the International Data Processing Institute returned after the Christmas recess last December to find the doors locked and the management gone.

"I've received claims totaling over $24,000 from 42 kids who hadn't finished their courses," said Assistant Attorney General Alfred B. Silverman, who handles consumer frauds for the office.

"The majority are still paying off loans they took out to pay their tuition. One student paid $1,600 and never had a day of class," he noted.

Attorneys for the bonding company, Fidelity & Deposit Co. of Maryland, turned over the check, which will be deposited in an interest account in Albany, while the claims are being processed.

Under state law, the school was required to post bond when it started operations March 1, 1969, before it could be licensed by the State Education Department.

Silverman said the school's parent company filed a bankruptcy petition in New York City about the same time the Buffalo branch closed down.

But, he said, "The local people have disappeared."

Saul Lerner, a Buffalo attorney, has been appointed referee by Supreme Court Justice Harold P. Kelly to determine how the money will be divided.

Confessions of a disk pack reject

"I'm good. I know I'm good. Almost everybody says so. And I was sure I could make it as an RCA Disk Pack.

"The 6-high RCA 506. Some of my best friends are 506s. And some are 11-high RCA 511s. For disk packs, either is a goal worth striving toward.

"Anyway, I thought I had it made when I started my final physical at RCA. They checked my sense of balance. Went over my tracks. Examined the quality of my coating. Gave me the toughest mechanical and electrical tests in the industry.

"Those people don't miss a thing. I didn't even get to the final test, a chance to prove myself on a computer. Seems I had a slight case of the run-outs.

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RCA Disk Packs

Modern 'David' Initiates Probes Into School Closing

By Thomas J. Morton
CW Midwest Bureau

DALLAS – There just might be another "David and Goliath" story taking place, but with the role of the teenaged "David" being played by a young girl, and the "Goliath" whom she would fell, a chain of computer schools.

Our young giant-killer, a minor whose name is being withheld, decided last fall that she would enjoy entering the computer industry as a trained and qualified programmer. She registered with Programming and Systems Institute of Dallas (PSI), and, with her father's help, gave a $300 down payment to the school and financed the balance, a little over $1,000, a reliable source stated, with a local finance company.

Later, but before she began classes, she changed her mind, as women of any age are allegedly capable of doing. PSI wrote the girl, telling her she was eligible for a refund of her tuition.

She never received it.

A little upset with making monthly payments on nothing, the young lady and her father complained to the Dallas Proprietary (trade) School Board at the board's meeting Feb. 25. The Proprietary School Board has the responsibility of governing the actions of trade and business schools in the city, and informed the young girl and her father that it would look into the matter.

But PSI had closed for the previous Christmas vacation and had never reopened.

A Dallas police investigation, undertaken at the request of Dallas Assistant City Attorney James W. Schoolfield, revealed that PSI of Dallas was a franchised operation of PSI of New York. The franchisee was Computer Aids Corp., a company owned by a Lipman Z. Rabinowitz of Cleveland.

'Not My Responsibility'

Schoolfield determined that besides the young mindchanger awaiting her refund, there were 30 stranded students. He told CW that he contacted Rabinowitz in Cleveland and was told by Rabinowitz that the young lady and the 30 students stranded by the closing of PSI were not his responsibility.

Schoolfield contacted the main offices of PSI in New York City and, he reported, was informed by PSI President Phillip Maron that the franchise could not and would not stand responsible for the actions of the franchisee.

Schoolfield then advised the stranded students that they were to file their complaints with the school board by the 15th of last month. Once filed, Schoolfield said, he presented them to the surety company of PSI of Dallas, promising to institute a suit in behalf of the plaintiffs.

In Dallas, a trade or vocational school is required by city ordinance to file a $10,000 surety bond to protect the students against any failure of the school to carry out its contract, or against any fraud perpetrated by the school, or any misrepresentations by the school.

Schoolfield said: "The surety company has the claims and is considering them. So far, it has not been considered necessary to institute any action."

Further investigation by the police, Schoolfield said, has revealed that Rabinowitz had leased some computers from DPA of Dallas for the school, and that the leasing firm has not as yet received payment on the rental. Nor has the owner of the building occupied by the school, Schoolfield added. "He owes the Dallas *Morning News* about $1,700 for advertising," Schoolfield said, "and he hasn't paid his instructors yet either."

Education

The students and the young lady, however, are still making payments on their loans. A spokesman for professional services company, the Cleveland Finance Co., making most of the student loans to PSI of Dallas, would not comment on the situation other than explain that the loans were personal loans and not directly connected with classes.

Schoolfield said that he had contacted the Federal Trade Commission and requested it to investigate whether there was a possible interstate fraud. He also requested the post office to investigate, and told CW that postal inspectors "are investigating the possibility of using the mails to defraud."

Casts a Cloud

Schoolfield added that "Maron has begun suit against Rabinowitz to disenfranchise him from PSI schools in Cleveland, Chicago, Cincinnati, and here in Dallas." Maron was reached in New York, but would make no comment other than confirming the legal action.

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Sanders Data Systems, Inc., is a subsidiary of Sanders Associates, Inc., Nashua, New Hampshire

Calendar

July 6-15, Haifa, Israel – Technion Computer Sciences Dept. presents the Second Annual Summer Seminar on Computer Science. Contact: M. Ariel, Chief Coordinator, Extension Division, Technion Research and Development Foundation, Haifa POB 4959, Israel.

July 8-10, Bloomfield Hills, Mich. – The Michigan Department of Education announces the first National Conference on Computer Applicaton to Learning. Contact: Mr. Carlton Robardy, Conference Coordinator, Michigan Department of Education, P.O. Box 420, Lansing, Michigan 48902.

July 22, Washington, D.C. – Information Industry Association presents IIA forum "New Concepts for Merchandising Information." Contact: IIA Washington, 1025 15th St., N.W., Washington, D.C. 20005.

Brooks Gets IEEE McDowell Award

ENCINO, Calif. – Dr. Frederick P. Brooks Jr., chairman of the department of computer and information science, University of North Carolina, has received the IEEE Computer Group's W. Wallace McDowell Award.

The award was presented in recognition of Brooks' outstanding contributions to computer architecture and programming and his leadership in cooperative efforts to further education in the computer field.

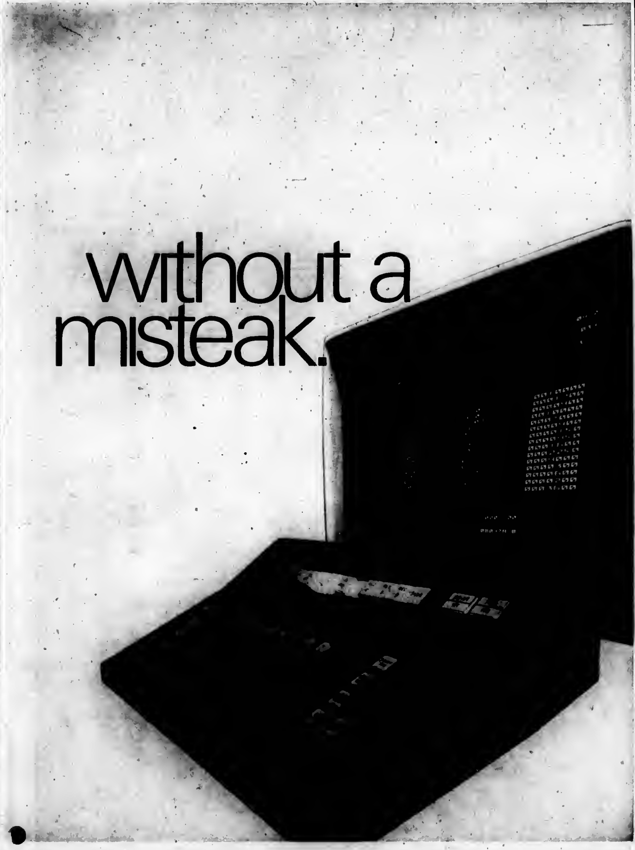
Brooks was recently selected as the DPMA computer sciences Man-of-the-Year [CW, June 3].

Dr. Edward J. McCluskey, chairman of the Computer Group, presented the award to Brooks during the group's recent conference and exposition in Washington, D.C.

The annual award was established five years ago by IBM in honor of the company's retired vice-president, W.W. McDowell, who played a major role in the transition of the industry from mechanical to electronic methods.

During 1963 to 1965, he was responsible for the engineering direction and the programming design of the IBM 360.

At the University of North Carolina over the last six years he built a graduate level department of computer and information science, was instrumental in organizing the Triangle University Computation Center, one of the nation's first regional computer networks, and has helped to develop the North Carolina Computer Orientation Project.



Cips Appoints Fierheller Head

VANCOUVER, B.C. – George Fierheller, president of Systems Dimensions Ltd., Ottawa, has been elected president of the Canadian Information Processing Society (Cips).

The elections were held as the recent three-day national conference, Session '70 – a joint conference of Cips and the Canadian Operational Research Society – concluded here.

Fierheller said the next Cips-sponsored event will be the first Canadian Computer Show which will be held in Montreal Sept. 14-16. Cips will hold a management session in conjunction with the show.

He also announced that the second annual Canadian Computer Show will be staged at Toronto's Canadian National Exhibition grounds Sept. 12-20, 1971.

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Going Once, Twice—Step in Line for Hardware Auction

By Harvey Elman
CW Staff Writer

NEW YORK – The first major auction sale of computer hardware in the U.S. will be conducted July 30 at the Parke-Bernet Galleries.

Consignments of peripherals and complete systems for auction are being assembled by Time Brokers Inc. (TBI), from firms representing many segments of industry. TBI, national brokers of computer time and equipment, will co-sponsor promotion of the sale with Parke-Bernet Galleries Inc., a large fine arts auction house.

The contents of the sale will range from second and third generation computers and their associated components to simple card-handling equipment. The consignments received to date amount to a total value in excess of $250,000.

Joseph Kirby of Time Brokers, who originated the idea of computer auctions, said: "People who own computers treat them with as much reverence as a work of art, because of their awesome capabilities and the immensely sophisticated prospects that they offer for the enhancement of future qualities of life. So why not sell them through Parke-Bernet?"

"Electronic hobbyists may even be interested," he said. "The devotee could start with a basic building block, which would be the storage or memory unit, then add accessories as he gains experience in the art of data processing."

Time Brokers is also on the look-out for historic pieces of equipment that may have memento value, said Kirby.

He stressed, however, that the purpose of the auction was not to sell "antique computers" but to fulfill a genuine need for supplying modern equipment to businesses.

Catalog Application

Consignments will be accepted until July 3. Buyers can apply after that date for the Parke-Bernet catalog. The equipment for sale may be inspected by appointment at current locations – some of it in a working environment. A small amount of equipment will be available in the PB-84 Gallery, 171 East 84th St., the day of the auction.

According to Time Brokers, it has already been approached by a number of large corporations wishing to sell surplus hardware and smaller businesses wishing to bid on good quality, used equipment. The current economic climate is viewed as a factor favorable to the auction.

Kirby said that the concept of a computer auction, expected to become a permanent feature of the business community, allows companies owning excess computer equipment to use a more efficient channel of distribution.

Will an auction be an effective way to market certain types of computer equipment? Parke-Bernet's vice-president in charge of administration, Arnold Kagan, thinks it can be. "We are excited at this diversification of our interests into the computer hardware field."

The auction is expected to receive coverage by the three national television networks.

If the auction proves successful, more sales will be conducted in the future on the same basis.

Chicago Software Production Feels Recession Cycle

By Thomas J. Morton
CW Midwest Bureau

CHICAGO – The national economy, with some slight geographical variances, is nine to 12 months into a recession. Chicago, a trailing indicator, is only three to six months into the depressionary cycle. The computer industry here, while not actually "feeling" the effects as other areas are, is fully aware of these tight money times.

One segment of the Chicago computer community is feeling the effects in the true sense of the word. That segment is the software producer.

The production of software became an industry, and an important one to the parent industry, in the late 1960s. With an acute shortage of people, anyone who could found up qualified programmers, systems analysts, and operation managers found that he had a very profitable business for himself. Firms with brand new computers threatening to stand there idle, or worse yet, be worked improperly, hired the new producers to guarantee the effectiveness of their new data processing operations.

Boom Industry

When unbundling by IBM took place – during the third quarter of 1969 – software was projected as a boom industry. But the software industry here wasn't ready, losing its greatest opportunity to date by default. Software wasn't prepared for the needs of a waiting, and eager, market.

When the producer sought financing to carry himself through the period it would take him to develop the packages for the waiting marketplace, he found, in some cases to his surprise, reluctant banks, soaring, and almost prohibitive interest rates, and hesitancy of brokers to discuss the possibilities of an underwriting.

Since packages weren't available, industrial firms here developed their own. Some, like Bell and Howell, have developed a good number of applications-oriented packages – payroll packages, bill of material processing packages, and other manufacturer/business-oriented programs. Some of these industrial firms, to reduce the developmental costs of their own packages, marketed them through other firms.

Layoffs

With these effects around him, the software producer is suffering. Entrenchings and the resultant layoffs occurred. Computer Business Consultants, Inc., a Chicago software firm, had opened a West Chicago branch and was in the working stages of opening a Cleveland branch. The plans for Cleveland were dropped, and the West Chicago branch was closed.

Masstech, another Chicago house, became part of a Des Moines, Iowa, insurance firm. CTI became a part of University Computing Corp. and stayed partially alive. On-line Services, a division of Computer Planning of California, closed its Chicago doors.

Emergency Mergers

With the closings, the emergency mergers, the cutbacks, and the inability of the software producer to find the money to float himself and his company through the six to 12 months it would take him to develop softwares to sell to the begging marketplace, came the layoffs.

These people, the highest paid professional and technical people in the computer industry, are having difficulty finding employment. Industrial firms and commercial enterprises are not enlarging their EDP operations.

Those businesses that are actually hiring EDP people are reluctant to hire the former software producer. The high salary he once commanded is to his disadvantage now. The EDP manager doesn't have the personnel budget that can afford him, and he won't hire the man at a figure he can afford because he feels the software pro would, in time, be unhappy because of it and may not even be worth it.

Temporary Relief

The EDP manager may feel that hiring the software man would only be a temporary relief to his own need; that the software man, used to a better salary, would soon leave the lower one, putting the EDP manager in the same position he was before he hired the pro. "It's a kind of a dilemma that exists," one executive of a recruiting firm specializing in computer personnel told CW. "Do these people lie about their previous salaries in the hope of getting one of the lower paying jobs, or do they maintain their current salary requirements and hope for one?"

Sources here feel, though, that both the national economic troubles and the difficulties in the areas's computer industry will end in 1970. Then the pendulum swings the other way for the software producer. One estimate is, on the national level, that the industry will be needing 40,000 people by the end of the year, a need that will be met by only one-fourth of that number.

It was a similar situation, an acute shortage of people, that brought the software producer into being in the first place. If it happens, as the experts insist it will, the software professional should have learned enough this time to be ready for it. If he hasn't learned, he really doesn't deserve the second chance.

Home at Last

A real computer community complex in the northern Midwest exists in Minneapolis, and with street signs to prove it. On her way back to work is Kathy Bolling, receptionist at Data Action Corp. (CW Staff Photo)

UK Hardware Deliveries Increase, Exports Amount to $42 Million

LONDON – Deliveries of computer hardware in the UK rose to a new quarterly peak of $150 million for the fourth quarter of 1969, of which exports amounted to $42 million, according to provisional figures recently released by the Ministry of Technology.

In both cases, more than half of the given figure was contributed by sales of digital computers, the remainder being comprised of analog and hybrid computers, data transmission equipment, peripherals, and independent control equipment.

The figures for the entire year of 1969 show that deliveries of hardware from the UK, including export deliveries and "factored" deliveries (factored equipment is defined as equipment which is sold but not manufactured by a UK company, and in practice is mostly imported) amounted to $497 million, an increase of 25% over 1968's figures of $396 million.

The rate of increase of home deliveries showed a decrease last year from the 1967-1968 rate, although deliveries were about 16% up from the previous year (the 1967-1968 rate of increase was nearer 30%). The export market, however, boomed, with a 52% increase over 1968 leading to a total of $148 million export deliveries.

Factored equipment, which showed an uncharacteristically low performance in the third quarter, picked up again in the fourth, doubling the quarterly total to a new record of $48 million. The figure for the year was $134 million, as against $362 million for British-made equipment.

Of digital systems delivered during 1969, the largest number fell in the Ministry's bracket between $12,000 and $45,600 value, with 636 delivered. The bracket below that, under $12,000, boasted 415 deliveries.

Unfilled orders at the end of 1969 amounted to $707.28 million, which divides into $539.28 million for the home market and $168 million for export.

UK Has 48,000 EDP Employees

LONDON – A total of 48,000 people were employed in the UK computer industry as of June, 1969.

This figure consisted of 34,400 males and 13,600 females, said Edmund Dell, Minister of State for Employment and Productivity. A geographical breakdown of the figures showed that 40,200 were employed in England, 7,700 in Scotland, and 100 (all men) in Wales.

Comma to Service Dyaflo Controllers

Dyaflo Business Machines Corp. and Comma Corp., New York, have signed a national maintenance and service contract through which Comma will perform field maintenance and support services for the Dyaflo line of computer peripheral controllers. Terms of the contract were not disclosed.

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Burroughs Creates Group To Develop New Systems

DETROIT – Burroughs has established a systems manufacturing and engineering group.

The new operating group is being created from the manufacturing and engineering units that have been part of the present business machines group for the last three years, according to Ray W. Macdonald, company president.

The new group is responsible for the development and manufacture of commercial DP systems and business machines in the U.S. and operates nine plants in the California, Detroit, and Philadelphia areas. The group employs some 13,000 persons.

The business machines group continues to be responsible for the marketing of commercial DP systems and business machines in the U.S., employing some 10,000 persons. "We have more than doubled our commercial systems manufacturing and engineering facilities in the U.S. in less than four years," said Macdonald.

Management Assistance Appoints Committee to Direct Operations

NEW YORK – Management Assistance Inc., a financially troubled lessor of DP equipment, has announced that the duties of chief executive and operating officer have been assumed by an executive committee of five directors.

The committee's chairman is Luther A. Schwalm, president, who formerly acted alone as chief executive. The company said the move "was intended to facilitate development of the board's programs to restore profitability on an expeditious and efficient basis."

MAI has divided its operations into three semiautonomous divisions – marketing, servicing, and international – each responsible to the executive committee for its own profitability.

The other committee members are Walter R. Oreamuno, board chairman; Raymond P. Kurshan, executive vice-president for finance and administration; Jorge M. Gonzalez, a former chief executive; and I. Cyrus Gordon, a lawyer.

For its first half ended March 31, the company previously reported a net loss of $41,000 after a special credit of $2.2 million. The special credit represented a minimum sum payable by Aug. 31, 1974, by Potter Instrument Co. to settle litigation.

Orders and Installations

The German Research Council, an agency of the West Federal Government in Bonn, has ordered two Control Data 3300 systems for installation at the University of Saarland and Giessen University. Total value of the two systems is $1.6 million. These latest additions bring to five the number of CDC 3300 computers installed in West German universities.

Public Service Co. of Colorado has ordered a CDC 1700/supervisory control system to monitor electric substations in the Denver area, give power outage locations to repair crews, process design and analysis studies, and forecast storms.

Hawkeye Bancorp. has installed the recently introduced NCR 720 remote banking system. Designed for use by banks which do not have ready access to a central data processing facility, the 720 system eliminates the need for such banks to physically transport documents off-premises.

Rockingham Memorial Hospital of Harrisonburg, Va., has installed an IBM System/3 to handle its paperwork.

Gould Inc., St. Paul, Minn., has received an order for 50 of its Model 4800 hard copy printers for computer systems. The recipient is Sumi, Tomo, Shoji, Kaisha, Ltd., Osaka, Japan. Sumi, Tomo plans to sell the printers to computer users in Japan.

The Strategic Air Command of the U.S. Department of Defense has ordered an IBM 360/85. The 544th Aerospace Reconnaissance Technical Wing (ARTW) will operate the new system to support intelligence requirements of the Joint Strategic Target Planning Staff, the Sac deputy chief of staff, intelligence, and the 544th ARTW. The Air Force's Strategic Air Command has also ordered an additional $1.2 million in memory and data base expansion equipment from General Electric to boost the capabilities of its GE-635 computer information system.

Virginia Commonwealth Services, Inc. and Gleason Works, Inc. of Rochester, N.Y., have each ordered a Burroughs B6500. Reilly Tar & Chemical Corp. in Indianapolis, Inc., has leased a B3500.

Position Announcements

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Contracts

Systems & Computer Technology Corp., West Chester, Pa., has been awarded a contract by the New Jersey Department of Education to perform a comprehensive information requirements study and systems design of an educational management information system.

Sykes Datatronics, Inc., Los Angeles, has awarded University Computing Co.'s Systems Support Division a contract to provide nationwide maintenance services for the Compu/Corder.

Digital Scientific Corp. has been awarded a contract to supply 200 Meta 4 computers to Logicon, Inc., San Pedro, and San Diego, Calif. Logicon will use the computers in a multiprocessor time-sharing system.

Systems Development Corp., Colorado Springs, Colo., has been awarded a 20-month, $474,000 subcontract to design and develop software for an Air Force communications system.

Dataram Corp., Princeton, N.J., has been awarded a $645,000 contract for memory systems by Clary Datacomp Systems, Inc. of San Gabriel, Calif. Clary will use the 4k by 16 systems in its small computer, the Datacomp 404.

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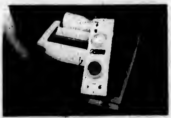

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IBM Again Defers L-T Move Pending Court Action

NEW YORK – Once again Levin-Townsend Computer Corp. has been rejected by a financial savior, once again IBM has moved to repossess the computers for which L-T owes money, and once again IBM has deferred its move pehding court action.

This time it was negotiations with GAC Corp. that fell through. The deal with GAC involved a $20 million loan to L-T and L-T's acquisition of GAC's unprofitable computer leasing subsidiary.

The joint statement of the two companies said that "it appears impossible satisfactorily to resolve the differences between all the parties involved." Industry sources indicated that the pending proxy fight of Howard S. Levin, deposed head of L-T, was a factor in GAC's decision to drop the deal.

Overdue Debts

In the past few months L-T has been searching for a solution to a critical cash flow problem involving overdue debts to IBM of about $15 million. Deals with Boothe Computer, Standard-Prudential Corp., and Randolph Computer have previously fallen through.

IBM deferred collection action on its debt until last month, when its threats of repossession caused L-T to file suit against the computer maker. IBM then withdrew its action and L-T continued talks with GAC.

When the GAC deal failed to pan out, IBM again moved to repossess, only to be stopped by an injunction request filed by Howard Levin. Levin asked Federal District Judge Morris E. Lasker for a temporary restraining order, which wasn't granted. However, IBM agreed to stop further action, including mailing notices to L-T customers, pending a hearing on a preliminary injunction.

Levin and Law

Levin has also filed an antitrust suit against IBM on behalf of L-T. His suit has been joined with those of the Justice Department and four other companies.

While refusing to comment on Levin's legal activities, an L-T spokesman said: "We are advising our customers that IBM has no right to repossess our computers because we have contract claims against IBM that exceed the amounts IBM claims are due. We have advised IBM that we are offsetting our claims against the amounts it claims to be due."

The statement apparently refers to the $55 million damage suit L-T filed against IBM a month ago. The two companies declared a truce while L-T negotiated with GAC, and the suit has been held in abeyance.

L-T owes IBM a total of $45 million for computers. Its latest financial statement, for the nine months ended Dec. 31, revealed a loss of $15.9 million, including heavy write-offs for unprofitable investments.

DEC's Olsen Says Final Audit to Show Substantial Gains, Expects Order Jump

MAYNARD, Mass. – While declining to cite any figures until the audited annual figures are released late this month, Digital Equipment Corp. President Kenneth H. Olsen said that the company will show "substantial gains."

Olsen said that because of the unsettled economic conditions DEC's small customers are having a hard time finding capital, and its large customers are stretching out orders. He noted that his company's inventories are satisfactory for the current backlog and that he expects order volume to increase, but expressed some concern about receivables, which, he said, aren't as good as they should be in a time of tight credit.

DEC's nine-month figures already show the company ahead of all of fiscal 1969. For the nine months, net was $10.4 million, or $1.10 a share. Sales were $97 million. For fiscal 1969 earnings were $9.3 million, or $1.03 per share, on sales of $87.9 million.

Olsen also spoke of DEC plant expansion. He said that two facilities of 260,000 sq ft each in Westfield, and Westminster, Mass., and smaller facilities in Leominster, and Maynard, Mass., Puerto Rico, and Canads are either completed or under construction.

He said that the expansion program will add 730,000 sq ft to DEC's already sizable total of one million sq ft of facility floor spsce.

Employment has reached 6,000, up from 4,360 at the beginning of the fiscal year.

Ampex Posts 6% Rise in Sales, Earnings

REDWOOD CITY, Calif. – Tape-making Ampex Corp. has revealed year-end figures that show a 6% rise in both sales and earnings for fiscal 1970. Per share earnings dropped slightly, however.

Sales for fiscal 1970 were $313,582,000, up from $296,319,000 a year earlier. Operating net earnings after taxes were $14,537,000, up from $13,702,000, according to William E. Roberts, president and chief executive officer.

Operating per share earnings for the year were $1.34 on 10,845,781 average shares outstanding, as compared with $1.35 on 10,172,185 shares in the preceding year. The company's fiscal year ended May 2, 1970.

An extraordinary charge of $2.3 million (net of applicable taxes) equivalent to 21 cents per common share has been made against fiscal year 1970 income. Net earnings and income per common share after this extraordinary charge are $12,237,000 and $1.13.

The extraordinary charge principally reflects the estimated cost of the transfer of production of closed circuit video products to other Ampex manufacturing facilities. A study, completed in late May, 1970, indicated that overall economies would result if these products could be manufactured in other Ampex locations, and such plans have been adopted.

It is expected that the transfer of manufacturing operations will be completed by the end of the current fiscal year.

Ennis Business Quarter Earnings Up 11%

ENNIS, Texas – Ennis Business Forms, Inc. recorded an 11% increase in earnings from operations on 22% higher sales for the first quarter of fiscal 1971.

President Leonard F. Gehrig said sales for the quarter ended May 31, 1970, rose to $10,895,183, compared to $8,954,126 for the corresponding year earlier period. Earnings per share increased to 23 cents on net earnings of $547,264, as opposed to 21 cents earnings per share before a nonrecurring item on $491,457 net earnings from operations for the first quarter last year.

In announcing the first-quarter gains, Gehrig said he was encouraged by increased volume, a somewhat higher order backlog, and contributions from acquisitions during the year.

As Well or Better

He projected that Ennis will do as well or better in fiscal 1971 as in the previous fiscal year, which had sales of $41,667,059 and per-share earnings of 97 cents on $2,329,687 net earnings.

Gehrig announced that Ennis plans within a year to consolidate operations in Portland, Ore., and Miami, Fla., into new, larger manufacturing plants. He also stated that the company has completed the move into its new 44,000-sq-ft Printed Media Division building in Ennis, and has recently moved into its expanded forms manufacturing facilities in DeWitt, Iowa.

Ennis is negotiating to purchase a business forms manufacturing plant in Hagerstown, Md., and Storm Printing Corp., a Dallas commercial printer.

ADP Agrees on Delta Data Acquisition

CLIFTON, N.J. – Automatic Data Processing, Inc. (ADP) has reached an agreement in principle to acquire Delta Data Processing, Inc. of San Jose, Calif., a privately owned seven-year-old data processing firm.

Frank R. Lautenberg, president of ADP, said the terms of the agreement call for Delta Data to be acquired for an undisclosed amount of stock and accounted for on a pooling-of-interests basis. Richard E. Dennis, founder of Delta Data, will remain as president of the company, to be known as ADP – Automatic Data Processing of San Francisco Inc.

Delta Data presently provides commercial data processing services to firms in the greater San Francisco area. Following the merger, operations will be moved to larger quarters in order to serve the San Francisco market with ADP's payroll, accounta receivable and other commercial data processing services.

ADP is a payroll specialist with computer centers in major metropolitan areas across the nation. This most recent acquisition announcement is part of the company's continuing geographic expansion program.

In May, ADP announced agreement to acquire the Houston computer center and data processing operations of Petro-Chem Computing, Inc. When completed, these two acquisitions will be the sixth and seventh made by ADP in the current fiscal year and the 16th and 17th in less than three years.

Spectral Dynamics Asks Systems to Stop Merger

FORT LAUDERDALE, Fla. – Systems Engineering Laboratories has been advised by Spectral Dynamics Corp. of San Diego that Spectral does not intend to consummate the merger of Spectral into a wholly owned subsidiary of Systems.

Systems and Spectral had previously announced that the merger would be completed June 26.

Systems Unwilling

Spectral has requested that Systems consent to the termination of the merger. Systems has not consented and has advised Spectral that unilateral termination is in violation of the merger agreement, which was approved by directors and stockholders of both companies. Systems is presently reviewing its legal position.

Systems designs, manufactures, and markets a broad line of real-time digital computers, related data acquisition and control equipment, computer peripherals, and computer-based keyboard data entry systems.

Spectral develops, manufactures, and markets electronic instruments and systems used in vibration and acoustic measurement and analysis, data acquisition, and structural design.

Redcor Board OKs Penta Merger; Pact Subject to Stockholder Vote

WOODLAND HILLS, Calif. – The board of directors of Redcor Corp. has approved the planned acquisition of Penta Computer Associates. The agreement is still subject to the approval of Penta stockholders at a special meeting to be held this week.

Redcor President and Chairman Emil R. Borgers said that if the merger goes through, Redcor will show a net loss of about $4 million for fiscal 1970, ending June 28. The loss would be caused by Penta's operating losses, write-offs of Penta R&D, and wiping out of sales by Redcor to Penta.

Borgers noted, though, that it was necessary to take the losses "so that the future of Penta's Keylogic data-entry system can be fully exploited. We look for substantial sales in Keylogic in fiscal 1971."

In fiscal 1969 Redcor earned $148,000, or 30 cents a share, on sales of $7.7 million. Redcor will acquire the assets of Penta for 300,000 shares of Redcor common, with a possible bonus of 250,000 more shares for Penta's owners, depending on the sales performance of the Keylogic system, according to the proposed terms.

The public shareholders of Penta would receive 106,260 of the 300,000 shares, while all of the 250,000 bonus shares would be reserved for Penta insiders.

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DiComes on Stocks

Computer Stocks Represent Real Buys

In a stock market fraught with uncertainty over "credibility gaps" and general malaise with the present economy, an ebullient investing public has seen fit to push the Dow Jones Averages up by at least 15% from their nadir.

With world situations weighing heavily on corporate pursestrings and rising uncertainty as to the improvement of earnings and the combatting of inflation, the investing public has still seen the wisdom of common stocks as a hedge against this spiraling inflation.

But what has become of our computer stocks? The investing public has noticed them, but only slightly. The small percentage rise in our charted issues has lagged far behind the average for the entire market and must draw our attention to them. If we can understand why the public has not bought them, we can find reasons for ourselves to buy them.

Magnitude of Applications

Security	Close 6/19/70	Suggested Purchase Price
Burroughs	108-1/8	(100)
Control Data	41-1/4	(35)
Foxboro	22-3/4	(Now)
Memorex	85-1/2	(Now)
RCA	21-1/4	(Now)
Xerox	80	(76)

DiComes' Purchase Recommendations

Basically, the general public as yet has no grasp as to the magnitude of the applications that can be made of computers in this modern world. Too often, those in the industry can catch themselves short for the supposed "intelligence gap" in their friends' minds when computers and programming are discussed.

If this be true from exposure to the industry, doesn't this hold true for exposure to computer stocks?

Robert DiComes is a retired broker who spends his time managing his stock and real estate portfolios, and a farm in New Hampshire.

Of the 15 most active stocks on the New York Stock Exchange for the week ended June 20, again, computer stocks garnered 20% of the list. Looking at the three in the list, let's rate them.

Telex, down from 25-7/8, but up from a low of 11 (after adjustment for a five-for-one split earlier this year), presents a sterling buy at its current asking price of 16.

3M Co., down from 114-3/4, but up from a low of 77-1/2, begs to be bought at 82. Not only is this a conglomerate with a product mix well received in many industries, but its earnings picture is fortified by products well known to the general public. In other words, bywords in most households!

University Computing, down from 99-3/8, but up from a low of 19-1/2, makes one wonder at its current price of 26-3/8. Obviously, from its participation in the industry and generally accepted product, at its current price, though we may not like the company that well, it shows good rebound possibilities.

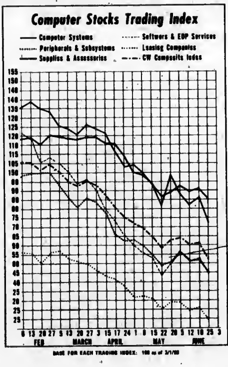
In summary, all three of the above Nyse stocks have not really participated to their fullest extent in the recent sharp rebound of the general market, and, because of an apparent popularity, could be bought at their present levels for short to intermediate term profits. 3M Co. can be considered a long-term hold.

Systems Engineering, down from 49-1/8, but up from a low of 14-1/4, comes up for active examination at its current price of 17-1/4. Though muddied by past doubts, we now look more optimistically at this company. In the 36 weeks ended March 6, 1970, Systems Engineering advanced in earnings to 55 cents a share as opposed to 44 cents a share the year previous.

Apparently, the air has cleared for this company, and, with its corporate expansion, the profit picture has brightened considerably. We can now rate this situation as a safe buy with excellent potential at its current price of 17-1/4.

I now like, especially at these prices, the issues in the accompanying box.

The letters from readers of this column have been most flattering. Time alone has prohibited my answering them earlier. However, please still feel free to write me: Robert H. DiComes, "Maison Rouge," Deerfield, N.H. 03037.



Computer Stocks Trading Index

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Computerworld Stock Trading Summary

NEW YORK AND AMERICAN STOCK EXCHANGE CLOSING PRICES, FRIDAY, JUNE 26; OVER THE COUNTER AND NATIONAL STOCK EXCHANGE, THURSDAY, JUNE 25

SUPPLIES & ACCESSORIES

EXCH	1970 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK PERCENT CHANGE
N	15- 8	9 7/8	ADAMS-MILLIS CORP	- 1 1/8	- 10.23
O	21- 12	12 1/4	BALTIMORE BUS FORM	- 1/4	- 2.00
A	25- 7	7 5/8	BARRY WRIGHT	- 1/2	- 6.15
A	35- 17	15 3/4	DATA DOCUMENTS	- 1 7/8	- 10.64
N	19- 12	13 1/2	ENNIS BUS. FORMS	- 1/8	- 0.92
O	17- 8	9 3/4	GRAPHIC CONTROLSCORP	- 1/2	- 4.88
N	166- 63	66 1/2	MEMOREX	-19	- 22.22
N	114- 77	77 1/2	3M COMPANY	- 4 1/2	- 5.49
O	38- 29	30	MOORE BUS FORMS	+ 5/8	+ 2.13
N	43- 21	23 1/2	NASHUA CORP.	- 5/8	- 2.59
O	48- 28	28	REYNOLDS & REYNOLD	- 4	- 12.50
O	30- 20	21 1/2	STANDARD REGISTER	- 1 1/4	- 5.49
N	39- 23	24 1/4	UARCO	- 1	- 3.96
O	30- 8	9 1/2	WABASH MAGNETICS	- 2 1/8	- 18.28
O	41- 25	31	WALLACE BUS FORMS	---	----

COMPUTER SYSTEMS

EXCH	1970 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK PERCENT CHANGE
N	172- 97	89 1/2	BURROUGHS CORP	-18 5/8	- 17.23
N	37- 12	12 7/8	COLLINS RADIO	- 2 1/8	- 14.17
N	122- 35	34 7/8	CONTROL DATA CORP	- 6 3/8	- 15.45
A	124- 57	57 1/2	DIGITAL EQUIPMENT	-15 1/8	- 20.83
N	11- 4	4 1/2	ELECTRONIC ASSOC.	- 5/8	- 12.20
A	14- 3	4 7/8	ELECTRONIC ENGINEER.	---	----
N	39- 21	21	FOXBORO	- 1 3/4	- 7.69
O	42- 12	13 1/4	GENERAL AUTOMATION	- 1 3/4	- 11.67
N	77- 60	67 3/8	GENERAL ELECTRIC	- 2 3/8	- 3.41
N	45- 24	23 5/8	HEWLETT-PACKARD CO	- 3 5/8	- 13.30
N	152- 70	68 5/8	HONEYWELL INC	- 9 3/8	- 12.02
N	387-237	257 1/2	IBM	-12 3/4	- 4.72
N	86- 46	44 1/2	NCR	- 8 1/8	- 15.44
N	34- 20	20 1/2	RCA	- 3/4	- 3.53
N	33- 16	20 3/4	RAYTHEON CO	- 3	- 12.63
O	8- 2	3 1/8	SCI. CONTROL CORP.	- 3/8	- 10.71
N	40- 24	25 1/8	SPERRY RAND	- 2 7/8	- 10.27
A	49- 14	15	SYSTEMS ENG. LABS	- 2 1/4	- 13.04
N	29- 12	12 1/2	VARIAN ASSOCIATES	- 2 1/2	- 16.67
A	51- 19	20 5/8	WANG LABS.	- 5 5/8	- 21.43
N	115- 70	72 5/8	XEROX CORP	- 7 3/8	- 9.22

LEASING COMPANIES

EXCH	1970 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK PERCENT CHANGE
O	9- 4	4 1/2	BANISTER CONTIN	- 3/4	- 14.29
O	25- 11	11 1/2	BOOTHE COMPUTER	---	----
O	8- 3	4 1/2	BRESNAHAN COMP.	- 1/4	- 5.26
O	8- 2	4 1/4	COMPUTER EXCHANGE	- 1 1/2	- 26.09
O	18- 4	---	COMPUTER LEASING	---	----
N	32- 6	8 5/8	DATA PROC. F & G	- 3 1/2	- 28.87
O	8- 3	3 1/4	DATRONIC RENTAL	- 1/2	- 13.33
A	24- 10	12 3/4	DEARBORN COMPUTER	- 7	- 35.44
O	8- 3	3 3/4	DIEBOLD COMP. LEAS.	- 1/2	- 11.76
A	10- 3	4 1/8	DPA. INC.	- 3/4	- 15.38
A	22- 7	10	GRANITE MGT	- 1 1/2	- 13.04
A	44- 5	6 1/4	GREYHOUND COMPUTER	- 1/2	- 7.41
N	30- 7	8 3/8	LEASCO DATA PROC.	- 2 1/4	- 21.18
O	5- 2	3	LECTRO COMP LEAS	---	----
A	19- 3	---	LEVIN-TOWNSEND CMP	---	----
O	3- 1	1 3/4	LMC DATA. INC.	---	----
O	4- 1	1 7/8	MANAGEMENT ASSIST	- 3/8	- 16.67
O	8- 3	4 3/8	NCC LEASING	- 1/8	- 2.78
O	8- 3	3 1/4	SYSTEM CAPITAL	---	----
A	19- 3	11 1/2	U.S. LEASING	- 2 1/8	- 15.60

PERIPHERALS & SUBSYSTEMS

EXCH	1970 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK PERCENT CHANGE
N	62- 24	24 5/8	ADDRESSOGRAPH-MULT	- 2	- 7.51
O	15- 2	3 3/8	ALPHANUMERIC	- 1/2	- 12.90
N	48- 13	16 5/8	AMPEX CORP	- 2 3/8	- 12.40
A	34- 5	7	ASTRODATA	- 7/8	- 11.11
O	11- 3	6 3/4	BOLT.BERANEK & NEW	---	----
N	14- 6	6 3/4	BUNKER-RAMO	- 1 1/2	- 18.18
A	33- 13	16 1/2	CALCOMP	- 2 5/8	- 13.73
O	13- 4	5 1/4	COGNITRONICS	- 3/4	- 12.50
O	12- 4	5	COLORADO INST.	- 1/8	- 2.44
O	36- 8	10 1/2	COMPUTER COMMUN.	- 1 1/2	- 12.50
A	12- 3	4 1/2	COMPUTER EQUIPMENT	- 1/2	- 10.00
A	28- 13	16	COMPUTEST	- 2 5/8	- 14.09
A	35- 7	8	DATA PRODUCTS CORP	- 1 3/4	- 17.95
O	23- 6	7 3/4	DATA TECHNOLOGY	- 1/4	- 3.12
O	13- 5	6 1/4	DIGITRONICS	---	----
N	40- 10	12	ELECTRONIC M & M	- 3 1/2	- 22.58
O	8- 3	4 5/8	FABRI-TEK	- 3/8	- 7.50
O	17- 2	2 3/4	FARRINGTON MFG	- 3/4	- 21.43
O	20- 6	6 1/2	INFORMATION DIS	- 1/2	- 7.14
A	67- 17	18 3/8	MARSHALL INDUSTRIES	- 4 5/8	- 20.11
A	84- 15	18 3/8	MILGO ELECTRONICS	- 4	- 17.88
N	87- 24	22	MOHAWK DATA SCI.	-10	- 31.25
O	52- 16	17	OPTICAL SCANNING	- 1	- 5.56
O	17- 4	5 1/8	PHOTON	- 1/4	- 4.65
O	4- 1	1 3/4	PHOTO-MAGNETIC SYS.	---	----
A	42- 21	19 1/2	POTTER INSTRUMENT	- 6 1/4	- 24.27
O	25- 11	11 1/4	PRECISION INST.	- 1 3/4	- 13.46
O	83- 21	27 1/2	RECOGNITION EQUIP	- 1/2	- 1.79
O	34- 5	5 3/4	REDCOR CORP.	- 1 1/4	- 17.86
N	29- 9	8 3/4	SANDERS ASSOCIATES	- 1 3/4	- 16.67
O	53- 7	10	SCAN DATA	- 1	- 9.09
O	23- 10	13 3/4	TALLY CORP.	+ 3/4	+ 5.77
N	25- 11	12 1/2	TELEX	- 3 1/2	- 21.88
O	50- 6	6 1/2	VIATRON	- 2 1/2	- 27.78

SOFTWARE & EDP SERVICES

EXCH	1970 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK PERCENT CHANGE
O	6- 2	2 1/4	ADVANCED COMP TECH	---	----
A	24- 4	5	APPLIED DATA RES.	- 1/4	- 4.76
O	18- 4	4 1/4	APPLIED LOGIC	- 1 1/2	- 26.09
O	8- 1	1 7/8	ARIES	- 1/8	- 6.28
A	47- 23	29 1/2	AUTOMATIC DATA PRC	- 3 3/4	- 11.28
O	14- 5	7 1/2	AUTO SCIENCES	- 1/4	- 3.23
O	9- 1	1 3/4	BRANDON APPL SYS	- 1 1/4	- 41.67
O	3- 1	1 1/2	COMPUTER AGE INDUS.	---	----
A	12- 2	3	COMPUTER APPL	- 5/8	- 17.24
O	14- 3	4	COMPUTER ENVIRON	- 1/2	- 11.11
NAT	10- 3	---	COMPUTER INDUS.	---	----
O	13- 2	2 3/4	COMPUTER NETWORK	- 1/2	- 15.38
O	15- 5	7 1/4	COMP. PROPERTY	- 1/4	- 3.33
N	34- 7	10 3/8	COMPUTER SCIENCES	- 1 3/8	- 11.70
O	8- 4	4 1/4	COMPUTER USAGE	- 1/4	- 5.56
A	75- 18	20 1/4	COMPUTING & SOFT	- 5 7/8	- 22.49
O	9- 2	3 3/4	COMRESS	+ 1/8	+ 3.45
O	14- 2	4	COMSHARE	+ 1/8	+ 3.23
O	3- 1	1 1/4	CONSOL. ANAL. CENT.	- 1/2	- 28.57
O	24- 4	4 1/2	DATA AUTOMATION	- 3/4	- 14.29
O	28- 9	9 1/2	DATA PACKAGING	- 1/2	- 5.00
O	6- 1	1 3/4	DATAMATION SERVICE	- 1/8	- 6.67
O	9- 5	6 1/4	DATATAB	- 1/2	- 7.41
O	4- 1	3	DIGITEK	+ 1/4	+ 9.09
O	13- 5	6 1/2	EDP RESOURCES	- 3/4	- 10.34
A	11- 5	6	ELECT COMP PROG	- 1	- 14.29
O	161- 31	39 1/2	ELECTRONIC DATA SYS.	+ 1	+ 2.60
O	20- 4	7 5/8	INFORMATICS	- 5/8	- 7.58
A	25- 6	8 7/8	ITEL	- 1 1/2	- 14.46
O	13- 1	---	LEVIN-TOWNSEND SERV.	---	----
A	25- 11	10 7/8	MANAGEMENT DATA	- 1 1/8	- 9.38
O	8- 3	3	NAT COMP ANALYSTS	- 1/8	- 4.00
O	12- 3	8 1/2	NAT.COMP. SERV.	- 1/2	- 5.56
N	54- 13	16 1/2	PLANNING RESEARCH	- 3 1/8	- 15.92
O	27- 9	11	PROGRAMMING METHODS	- 1/2	- 4.35
O	5- 2	3	PROGRAMMING & SYS	---	----
O	33- 3	4 1/4	PROGRAMMING SCIENCES	- 1/2	- 10.53
N	22- 3	3 1/4	SCIENTIFIC RESOURCES	- 1/4	- 7.14
O	2- 1	1	SOFTWARE SYSTEMS	---	----
O	27- 6	8	TBS COMP CENT INC.	---	----
O	4- 2	3	UNITED DATA CENTER	- 3/8	- 11.11
N	99- 19	24 5/8	UNIVERSITY COMP.	- 1 3/4	- 6.64
A	20- 5	6	URS SYSTEMS	- 7/8	- 12.73
O	13- 3	3 3/4	U.S. TIME SHARING	---	----

Earnings Reports

VERNITRON CORP.
Thirteen Weeks Ended March 28

	1970	a1969
Shr Ernd	$.12	b$.28
Revenue	12,046,245	12,212,975
Earnings	376,033	b886,275

a-March 29, 1969. b-The figures for first quarter 1969 are as reported, adjusted for subsequent poolings of interests. (The 1969 year and figures showed. net earnings of $121,330, equal to four cents per share.)

On a fully diluted basis, earnings per share for the 1970 quarter are 11 cents. For the 1969 period, fully diluted earnings per share were 26 cents.

LMC DATA INC.
Year Ended Feb. 28

	1970	1969
Revenue	$3,842,992	$4,012,590
Spec Cred	a147,689	.....
Loss	385,280	32,389

a-Excess of face amount over repurchased price of the company's 6-1/2% convertible subordinated debentures.

DCS COMPUTER SERVICES, INC.
Three Months Ended March 31

	1970	1969
Shr Ernd	$.03	.....
Revenue	203,872	.....
Earnings	15,096	.....
a6 Mo Shr	.05	.....
Revenue	347,374	.....
Earnings	24,359	.....

a-Subject to audit and year-end adjustment.

TOPAS COMPUTER CORP.
Year Ended Dec. 31

	1969	1968
aShr Ernd	$.14	$.08
Revenue	2,899,040	2,001,404
Earnings	107,970	50,393

a-Based on average number of shares outstanding during the year.

INFOTRONICS CORP.
Year Ended March 31

	1970	1969
Shr Ernd	.....	$.19
Revenue	$5,824,401	5,227,414
Loss	a670,530	b172,225

a-Includes, after a change in accounting method, effect of expending research and development costs of $509,890, incurred in prior years, and $600,547 in the latest fiscal year, A total of $1,110,437 expensed in fiscal 1970. b-Income.

ENNIS BUSINESS FORMS
Three Months Ended May 31

	1970	e1969
Shr Ernd	$.23	a$.21
Revenue	10,895,163	8,954,126
Spec Cred	.....	b60,543
Earnings	547,264	c552,000

a-Based on income before special credit and adjusted for a 100% stock distribution in December, 1969. b-Proceeds from life insurance. c-Equal to 23 cents a share. e-Restated to include acquisitions on a pooling-of-interests basis.

USR SYSTEMS CORP.
Three Months Ended April 30

	1970	1969
Revenue	$5,502,000	.....
Loss	135,000	.....
6 Mo Shr	.11	.....
Revenue	11,279,000	.....
Earnings	250,000	.....

DATATRON PROCESSING INC.
Six Months Ended April 30

	1970	1969
Shr Ernd	$.09	$.09
Revenue	3,779,667	3,242,380
Earnings	503,032	489,869

Shaky Market Halts Merger

PALO ALTO, Calif. – The shaky stock market has stopped another merger.

Optimum Systems Inc. has revealed that it has called off its planned acquisition of U.S. Time-Sharing (USTS) of Reston, Va. Stockholders of both companies had previously approved the move.

According to an Optimum statement, "General market conditions were assigned as the underlying reason for the termination."

Optimum specializes in the design and installation of information systems and offers multi-access computer systems, while USTS is a time-sharing firm.

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